

INNOVATION IN NAVY
PUBLIC WORKS PROCEDURES

Thomas David Best

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by

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B.S. in Building Construction Technology Bradley University, 1963

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ABSTRACT

Signature

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Thomas David Best, M.P.W. M.S.C.E.

University of Pittsburgh, 1973

The purpose of this thesis is to determine if the Navy can simplify its public works procedures and thereby reduce the associated overhead.

Due to past and present facilities maintenance funding and personnel levels, age and condition of the physical plant, recent hard use to support the Vietnam war, size of the plant over which maintenance resources are disbursed, and the state of the art in procedural and physical productivity, the backlog of identified facilities maintenance deficiencies is soaring. The backlog is growing at a rate only slightly supported by inflation and the addition of new facilities.

There are three basic alternatives that could be taken to reduce the maintenance backlog. More resources could be applied to the

problem. The number of facilities or activities over which the resources are spent could be reduced. Physical or procedural innovation could be utilized to make whatever resources are available go further. None are mutually exclusive and each should be pursued.

This thesis will concern itself only with the procedural innovation aspect of the third alternative. The author had worked within the Navy's "Controlled Maintenance System" in the past and was basically familiar with it.

During a visit in April, 1973 with Mr. James B. Smith (a former associate in a Navy Public Works Center, who is now the Maintenance and Repair Division Director at Marine Corps Base, Camp Lejeune, North Carolina) the author was exposed to the Camp Lejeune facilities maintenance system. After discussions and tours of the Facilities Maintenance Department and Camp Lejeune itself, the enthusiasm that Mr. Smith and other Camp Lejeune facilities maintenance managers have for the facilities system they work within, was transferred to the author.

The Camp Lejeune Facilities Maintenance System appeared to be simpler than the Navy's and to operate successfully with fewer overhead personnel. This thesis therefore will basically be a comparison of the standard Navy facilities maintenance procedures and those of the Marine Corps Base at Camp Lejeune. Two return visits were made to Camp Lejeune to talk to various public works managers and observe their system. In addition three interview and data gathering visits were made to the Headquarters Marine Corps and the Naval Facilities Engineering Command, both in Washington, D. C.

From these interviews, observations, and Navy and Marine Corps public works procedure manuals, the following conclusions were reached. It was concluded that the Navy's procedures were more cumbersome and expensive than need be; that the Navy needs a preventative maintenance program for buildings; and that there are several areas where automatic data processing could be effectively introduced into Navy public works.

It was further concluded that the Navy's long and complicated "chains" of command, resources, and technical advice for facility matters may be detrimental to cost effective public works. It was also concluded that the Navy needed a long range facilities maintenance plan.

It was recommended that appropriate personnel from the Naval Facilities Engineering Command and its field activities visit the Facilities Maintenance Department at Camp Lejeune, North Carolina to personally observe the public works procedures. It was also recommended that those innovations felt transferable, be transferred to other field activities for additional evaluation or adoption.

DESCRIPTORS

Maintenance

Public Works

Maintenance Management

Real Property

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GLOSSARY

Activity (also installation). "A unit of the Naval establishment, of distinct identity, established ashore under a commanding officer or officer in charge." (1)

Backlog of Essential Maintenance and Repair (BEMAR). "The backlog of essential maintenance and repair consists of those items of maintenance and repair defined in DOD directive 7040.2 over \$10,000 which cannot be accomplished during the current fiscal year due to lack of resources. An item is considered essential when delay for inclusion in a future program will impair the military readiness and capability, or will cause significant deterioration of real property facilities." (2)

Backlog of Essential Minor Maintenance (BEMM). The same as BEMAR except the cost per item is \$0 to \$10,000.

Billet. A specific employment position. Usually refers to military positions, but can be used for civilian positions also.

Category Code. Category codes for military real property are the "... standard codes and nomenclatures for codifying Class I and II Real Property (land and improvements thereto) owned or controlled by the Department of the Navy. These codes provide the means to uniformly classify all real property of the Navy from the initial planning stages through the complete cycle of programming, construction, inventory, accountability and maintenance." (3)

Class I Real Property. Land. (4)

Class II Real Property. Improvement to land (buildings, structures, and utilities). (5)

Engineering Field Division (EFD). NAVFAC representative for a particular geographic area. (Formerly called Bureau field division (BFD)).

Facility. "A separate, individual building, structure, or other item of real property, including land, which is subject to separate reporting under the Department of Defense real property inventory." (6)

Fiscal Year (FY). From 1 July to 30 June.

Host Tennant Agreement. A formal written agreement between an activity which "Owns Class I and II property and another activity who occupies a portion of the property. The agreement spells out the conditions of occupancy and which services will be provided free or charge and which will be provided on a cost reimbursable basis.

* Parenthetical references placed superior to the line of the text refer to the bibliography.

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Installation. See activity.

Maintenance. "The recurrent, day-to-day, periodic, or scheduled work, required to preserve or restore a facility to such condition that it may be effectively utilized for its designated purpose. This includes work undertaken to prevent damage to a facility that otherwise would be more costly to restore."⁽⁷⁾

Major Claimants. "The Bureaus, Offices or Commands directly under the Chief of Naval Operations, which administer funds for their subordinate commands."⁽⁸⁾

Mid-Year Review. A standard part of the overall budget cycle. Approximately halfway through the fiscal year a financial review is made between activities and superiors to ascertain how the execution aspect of the budget cycle is progressing. Adjustments in funding levels may be made as a result of the mid-year review.

Naval-Facilities Engineering Command (NAVFACENGCOM or NAVFAC). A sub-major claimant, sometimes called a systems command, reporting directly to the Chief of Naval Material who is a Major Claimant. Some of the duties and responsibilities of NAVFAC are spelled out in heading 2.11.

NAVFAC REP. "The NAVFAC REP is an organizational part of an EFD. Its function is to provide to a designated Command, professional advice and assistance on the full scope of facilities matters for which the Command has responsibility."⁽⁹⁾

Navy Industrial Fund Activity (NIF Activity). An activity which does not receive any funds directly appropriated for its operations. These activities charge customers for any work performed and an additional fee to cover overhead costs.

Planner and Estimator (P&E). A billet, normally filled by a civil servant, who plans the manpower, material, and execution of a particular item of work and then estimates the cost of the work. He normally is a functional specialist in one of the following categories: electrical, mechanical or structural.

Special Project. "A project--above the approval authority of the commanding officer--for maintenance, repair, minor construction, or equipment installation, to be financed from appropriations available for operations and maintenance, from overhead, or from nonappropriated funds."⁽¹⁰⁾

Sub-Claimant. Usually a commander in charge of a functional area of responsibility directly under a Major Claimant.

Systems Command. The name given to sub-claimants that work for the Chief of Naval Material.

Tenant. An activity who occupies Class I or II property of another activity.

Type "A" Annual Inspection Summary (or Annual Inspection Summary). "A facility condition report which lists the maintenance deficiencies in existing buildings, structures, utilities systems, and other facilities annually." (11)

Unilinear Navy. One "chain of command" from the Chief of Naval Operations to each activity. Formally, there was a command "chain" and a resources "chain."

1.0 INTRODUCTION

1.1 General

The fundamental objectives of the Department of the Navy, are:

"To organize, train, equip, prepare, and maintain the readiness of Navy and Marine Corps forces for the performance of military missions as directed by the President or the Secretary of Defense." (12)

1.11. The Navy Shore Establishment

The United States Navy has a very large shore establishment which exists to support these objectives. A major element of this shore establishment is Class I property (land) and Class II property (facilities structures, utilities). The total present worth of the Class I and Class II portion of the shore establishment is approximately thirty-three billion dollars.⁽¹³⁾ By far the largest acquisitions to the physical shore establishment came during WW II. Therefore the average age of this physical plant is growing older year by year. This fact, coupled with tremendous inflation of labor and material costs, and some actual reductions in the number of dollars and personnel available, has resulted in skyrocketing backlogs of unfunded maintenance usually called backlog of essential minor maintenance (BEMM)¹ and backlog of essential maintenance and repair (BEMAR) studied in the thesis of Paul Morrison 1970, and William Hatter 1972.

¹ Once introduced, abbreviations will be used except where the longer form is needed for clarity.

1.12 Facilities Maintenance Backlogs

The theory behind keeping a running status of facility maintenance backlog is simple and direct. If the backlog of unfunded maintenance goes up, then more money is needed to keep the physical plant in a steady state condition and the application of increased funds will bring the backlog down; the reverse also being true. There is nothing wrong with the theory or logic of this system, but; what if additional funds are not forthcoming in sufficient quantity (for whatever reason) as the backlog skyrockets?

Due to past and present facilities maintenance funding and personnel levels, age and condition of the physical plant, recent hard use to support the Vietnam war, size of the plant over which maintenance resources are disbursed, and the state of the art in procedural and physical productivity, the backlog of identified facilities maintenance deficiencies is soaring. (See Figure 1).

In fiscal year 1972¹ \$282,052,000 were spent for maintenance of Navy facilities valued at \$33,000,000,000.⁽¹⁴⁾ The Marine Corps owns Class I and Class II property valued at \$3,120,000,000 and spent \$42,474,000 on its maintenance in fiscal year 1973.⁽¹⁵⁾ As can be seen these amounts are not small expenditures in any sense of the word. Possibly even more important is the potential strategic support role the facilities may be called upon to play.

¹ Fiscal year 1973 figures were not yet available.

NAVY BACKLOG OF MAINTENANCE
AND REPAIR (BEMAR) TRENDS

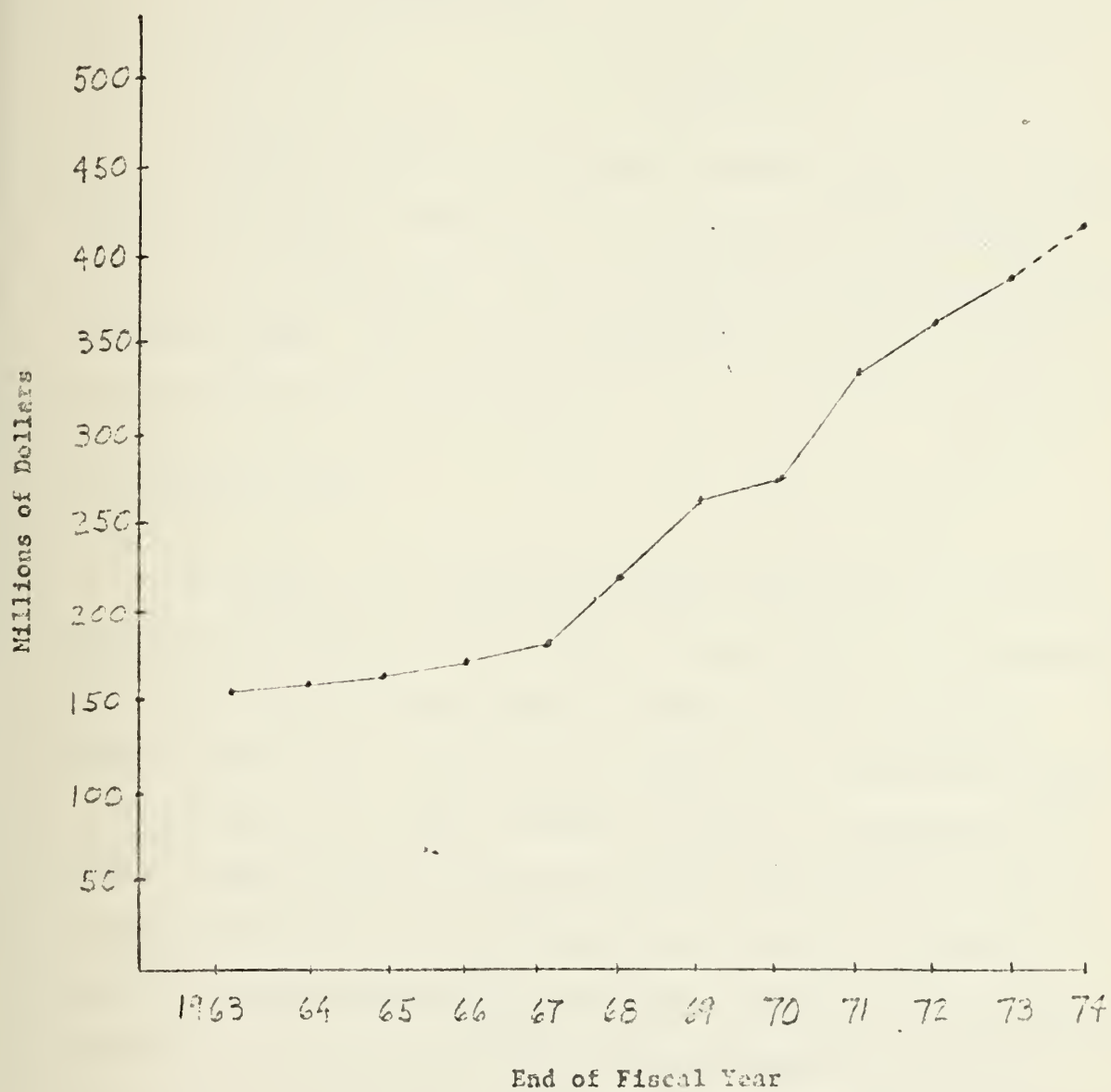


FIGURE I (16)

1.2 Facilities Resources Dilemma and Alternatives

If the resources provided to a particular function (say physical plant of the Navy) do not reflect requirements then there are basically three things that could or should be done by the people responsible for this particular functional area.

1.21 Alternative One

They might attempt to obtain the increased resources, by demonstration of need and forecasting of the consequences if additional resources are not forthcoming. This is the primary thrust of the concepts of BEMM and BEMAR. This is also characterized by trying to increase the facilities portion of the budget.

1.22 Alternative Two

They might try to reduce the resource requirements by reducing the number of facilities and/or bases in active support of the operating forces. This would include closure or disposal of whole bases or individual facilities. This past year closure of or reduction at many Navy installations has been "announced," though not completely accomplished. Admiral Zumwalt, the Chief of Naval Operations, has said many times that our Navy of the future will be leaner but stronger. Certainly he faced tough decisions in cutting the number of Naval vessels from 932 to 584 and the number of aircraft squadrons from 181 to 161 between FY 68 and FY 73. Ship reductions are slated to continue to 518 by FY 74 year end. (17)

The two situations, reduction of ships and airplanes, and reduction of bases are not precisely congruent. Aircraft and ships have shorter life spans, and more importantly: obsolescence is much faster than a general support base. If future situations dictate additional bases are necessary, acquisition of suitable land in large pieces and facility construction will be difficult and time consuming. This is especially true when compared to the development of a new class of ship or aircraft, where design and assembly space already exist. The impact on adjacent communities by either closing a base or acquiring land for a new base is also much more traumatic than moving or decommissioning a squadron of aircraft or ships.

The discussion of facility budgeting procedures in heading 4.32 illustrates that a reduction in the number of actively used facilities will not, in itself, reduce the amount of resources provided for facilities maintenance.

1.23 Alternative Three

Plans and innovations could be developed to maximize the effects of whatever resources are available. This can be subdivided into two categories: procedural innovating and physical innovations. It is of course an obligation of the public trust to maximize resource utilization, and improvements can always be made. If alternatives one or two above succeed in bringing or concentrating more resources, then improved procedures or productivity will multiply these additional resources.

1.24 Summary

To put the three proposals in perspective: total resources requirements to accomplish a definite objective should always be known each year whether the resources are forthcoming or not. Secondly, just as surgery is sometimes used by doctors to improve the overall health of the patient, disposal (or placing in caretaker status) of installations must be considered on a continuing basis as a means of optimal resource utilization. The third proposal, while justified on its own merit, can reduce the resources required and possibly eliminate or forestall "radical surgery."

1.3 Objectives of Thesis

This thesis will concern itself with innovation in Navy Public Works Procedures.¹

The Marine Corps Base at Camp Lejeune, North Carolina has, while beginning with the Navy system, innovated on it, to achieve what appears to be satisfying equilibrium between Controlled Maintenance and Uncontrolled maintenance. They appear to have greatly simplified procedures and reduced overhead personnel to an almost irreducible number, without sacrificing essential amounts of planning or control for management or budgeting purposes. It is believed that many of the innovations can be successfully transferred to Navy Public Works and would make Navy Public Works more cost effective.

¹ It is submitted, that while the Navy's facilities maintenance procedures are logical and appropriate, they may be, in practice, more cumbersome and expensive than need be.

1.31 Methodology to be Used

In order to test the hypothesis that the Navy's facilities maintenance procedures can be streamlined and made more cost effective, the similarities and differences between the Marine Corps facilities maintenance system (specifically Camp Lejeune, North Carolina) and the standard Navy Controlled Maintenance System will be identified and discussed. As various management theories have relevance, it will be pointed out how they are supported, or not supported, in either of the two systems. (i.e., One system may support traditional concepts of the rigid, heavily directed work procedure and accomplishment, and another may support individual/small group choice and responsibility. The differences will be discussed specifically as to which would appear to facilitate greater productivity and/or job satisfaction).

Side issues which have bearing will also be addressed. Some of these are: The length of the funding chain; the total dollars invested per million dollars of plant value; the impact of base size; personnel selection and retention; job satisfaction and enrichment; and further extensions of the Camp Lejeune system.

Much of the data was gathered through interviews with practitioners of both systems and their superiors as well as Navy and Marine Corps procedure manuals. Financial, personnel and facility reports were also consulted.

The term facilities maintenance will be used because it is easier to follow the discussion if only one aspect of public works is addressed. This aspect was selected since it is the core function and

to which all the discussions apply. This does not rule out the application of the procedures discussed to other aspects of Public Works such as alteration and improvements, utilities maintenance, and even transportation.

1.4 Navy and Marine Corps Relationships

Clarification of certain relationships between the Navy and Marine Corps are necessary for effective understanding. The Secretary of the Navy is the office at which budgetary and facilities matters come together. Below this office each is an "independent" service, except for operational control which is exercised by the Chief of Naval Operations.⁽¹⁸⁾ Since the Marine Corps is organizationally within the Department of the Navy, they follow the Navy Comptroller's manual which specifies accounting procedures and practices.⁽¹⁹⁾ This fact facilitates study comparisons between the Navy and Marine Corps public works costs. For example the Marine Corps while only using five productive labor class codes to the Navy's seven (shown in figure 4) still defines the work in such a way that comparisons can be easily made. Many Marine Corps support functions are provided by the Navy or Navy personnel. For example, there are only Navy Hospitals, Doctors, Dentists, Chaplains, Nurses, Corpsmen, and Civil Engineer Corp Officers. These people are functioning within their primary Navy specialty when performing these functions. When Marine Corps military men are involved in providing support functions such as Public Works, it must be remembered that these Marines are operating in their secondary specialty. Their first specialty is that of a fighting man. Marine Corps civilian

employees who work in a functional support area are of course working in their primary specialty area.

1.41 Translation of Terms

To avoid confusion over the terms such as Public Works Officer the following clarification and translation is provided. The Navy places the following areas of responsibilities with a Public Works Officer.

- (A) facilities planning and programming;
- (B) real estate management;
- (C) facility design and construction;
- (D) facilities maintenance, repair, minor construction, alteration and equipment installation;
- (E) utilities system operation and maintenance;
- (F) facility disposal;
- (G) transportation fleet management, operations, and maintenance;
- (H) housing administration;⁽²⁰⁾

At a Marine Corps Base a "Public Works Officer" would perform only functions A, C and F.⁽²¹⁾ Therefore, in an attempt to avoid confusion and since this is being written from a Navy point of view; the names of Marine Corps Departments or Divisions will be changed to the nearest Navy equivalent with an abbreviation or the actual Marine Corps Department or Division name following. Below is a list of all term translations that will be used.

Marine Corps Public Works Terminology

Equivalent Navy Terminology

Public Works Officer

Engineering and Planning Officer
(MC,PWO)

<u>Marine Corps Public Works Terminology</u>	<u>Equivalent Navy Terminology</u>
Public Works Department	Engineering and Planning Division (MC,PWD)
Operations Division	Maintenance Control (MC,OPS DIV)
Maintenance and Repair Division	Maintenance Division (MC,M&RD)
Director Facilities Management	Public Works Officer (MC,DFM)
Facilities Management Office	Public Works Department (MC,FMO)
Motor Pool	Transportation Division (MC,MP)
Base Maintenance Department	No exact equivalent, but will be referred to as Shops Engineer (MC,BMD)
Work Management Branch	Production Control Branch (MC,WMB)

1.5 New Limiting Factors

Money has always been considered the paramount resource; which if available in sufficient quantities could purchase all other needs. There are other resources which are now, or may soon become limiting factors and therefore reduce the beneficial impact of additional dollar resources.

1.51 People

Probably the next limiting factor that has been, and will continue to be felt is people. For various reasons, primarily the phasing down and end of the Vietnam war, the number of uniformed Navy personnel on active duty has been dramatically reduced from 775,900 to 564,500 between FY 1969 and FY 1973.⁽²²⁾ While this would appear to reduce the wear and tear on shore facilities (and has to some extent), it must be

remembered that the largest cuts have been in operating forces; ships, planes, Seabees, etc., who were not using facilities located in the United States. Yet the effects of winter, rain, hurricanes, sun, age, etc., which are a much more important factor in facility maintenance costs, take the same toll on facilities every year.

The number of Navy Department Civilian Personnel who actually perform almost all the facilities maintenance in the United States (in addition to many other functions) has been cut from 419,500 to 321,800 between FY 68 to FY 73.⁽²³⁾ (Most of these cuts were in practice accomplished by attrition).

One major offsetting factor which has allowed facilities maintenance to keep up as well as it has, has been contracting of millions of dollars of facilities maintenance work. Many other services performed by Public Works Departments such as garbage collection and janitorial services, have also been contracted out which allows the civilian billets remaining to be concentrated on facilities maintenance. There are, however, limiting factors on contracting work. Manpower and dollars are required to prepare specifications, and to award and inspect the contracts.

Practically speaking, the jobs that can be contracted most successfully with the largest cost savings are the larger and/or more repetitive, easily inspected ones, such as grass cutting, janitorial services, painting and garbage collection. Sometimes a total cost analysis will reveal contracting is more expensive (which would mean it should be done "in house"), but if sufficient billets are not available, there is no alternative.

Predictable phenomenon also occur. A decision to contract all grass cutting normally will bring good first year bids, but after the activity has disposed of its mowers, the successful bidder owns equipment with useful life left, and other bidders own none; then future bids can be expected to rise at a rate only partially supported by increased costs.

The limiting factor of people, military and civilians, is being felt and emphasizes the need to find ways to reduce overhead and increase the productivity of production personnel so that the necessary functions will still be accomplished.

1.52 Energy

Soon energy will be a major limiting factor for the Navy and Marine Corps. It already has affected ship, plane, and motor vehicle transportation operations. It is believed secondary energy consumption, such as the use of paper, lumber and other materials, all of which take energy to manufacture and deliver, will also become major issues. This emphasizes the need to implement procedures and practices which conserve energy directly or indirectly.

2.0 NAVY PUBLIC WORKS

2.1 The Environment of Navy Public Works

It is important that the environment of Navy Facilities Management be explored in detail in order to clarify subsequent discussions.

2.11 Facilities Responsibility Assignment

The Chief of Naval Operations has assigned many facilities related functions specifically those of a technical or staff nature to the Chief of Naval Material, who has in turn re-assigned these responsibilities to the Naval Facilities Engineering Command (NAVFAC). The assigning document reads in part as follows:

"Authority Over Organizational Matters. Under the Chief of Naval Material, the Systems Commanders (of which NAVFAC is one) are responsible for the utilization of resources by and for the operating efficiency and work or activities included in their respective commands. Except as otherwise provided by law or higher authority, the Systems Commanders may assign appropriate authority and responsibility and may organize their respective headquarters organizations and shore activities. However, they are not authorized to establish or dis-establish shore activities."

"Administrative and Technical Support and Guidance. Systems Commands shall provide administrative and technical support and guidance to the Department of the Navy, other military departments, and other agencies, in accordance with their assigned functional and material support responsibilities. This support and guidance shall include: The establishment of standards and procedures; professional and technical advice, guidance, and assistance; performance of specialized administrative or technical functions or services; and review and evaluation of the implementation of such guidance, as appropriate. Technical support and guidance includes

specialized or professional service performed, or professional direction exercised through the promulgation of policies and procedures in technical matters.

The Systems Commands shall provide the active and reserve Operating Forces of the Navy, the Marine Corps organizations with appropriate guidelines and support on technical matters within their respective areas of assigned responsibility. Such guidance and support will cover, as appropriate, but is not limited to, the operation, repair, overhaul, alteration, maintenance, upkeep, handling, and facility requirements for, equipment and systems, weapons, weapons systems, aircraft, explosives, vessels, craft and other assigned items, including training equipment; supply management, publications and printing, resale and food service, and facilities maintenance management."

"Personnel; Officer Specialists and Corps. Systems Commanders are responsible to the Chief of Naval Material for providing professional technical advice in the areas of technology under their purview, and for the maintenance of the highest professional competence among their civilian employees, enlisted personnel, and officer specialists or corps which they sponsor."

"Management Information Systems. Systems Commanders are responsible for developing and administering management information systems and automatic data processing systems in support of their management responsibilities and developing and/or implementing such other Navy-wide data processing systems as may be assigned by the Chief of Naval Material."

"The Commander, Naval Facilities Engineering Command is responsible for providing advice and assistance regarding:

1. Maintenance of grounds, buildings and structures. (Class I and Class II property) and related service assigned, except at ground activities of the Marine Corps, and other specifically excluded activities;
2. Operation and maintenance of utilities and automotive, railway, weight-handling and construction equipment, except at ground activities of the Marine Corps, and other specifically excluded activities; and
3. Facilities minor construction and major repair projects.

"Administrative and Technical Support and Guidance
In addition to providing other technical support and guidance as appropriate in connection with the responsibilities set forth above, the Commander, Naval Facilities Engineering Command shall be responsible for the development and maintenance of the Navy Facilities System as an integrated and comprehensive entity combining into one Navy-wide facilities system the functions and procedures necessary to ensure integrated facility support in the planning, programming and execution of Naval missions." (24)

The above is intended not only to give background, but to illustrate that The Naval Facilities Engineering Command has the prerogative and responsibility to pursue procedural and technical innovation in all public works related matters.

2.12 Organizational Relationships

The actual accomplishment, financing and field organizations to carry out facilities acquisition and maintenance have undergone several major revisions in the last fourteen years. The present organizational framework is illustrated in Figure 2. Money and line authority flow down the (left) chain to the Public Works Officer and technical advice, deficiency validation, and facilities management advice flows across from the "Engineering" or "Staff" chain to the line chain. It should also be kept in mind that operating control and money (for non NIF activities) flows down the (right) or "Engineering" chain for internal operations, three Construction Battalion Centers and eight Public Works Centers. (This is an important point to remember, when recommendations are made in heading 5.0).

UNILINEAR NAVY CONCEPT

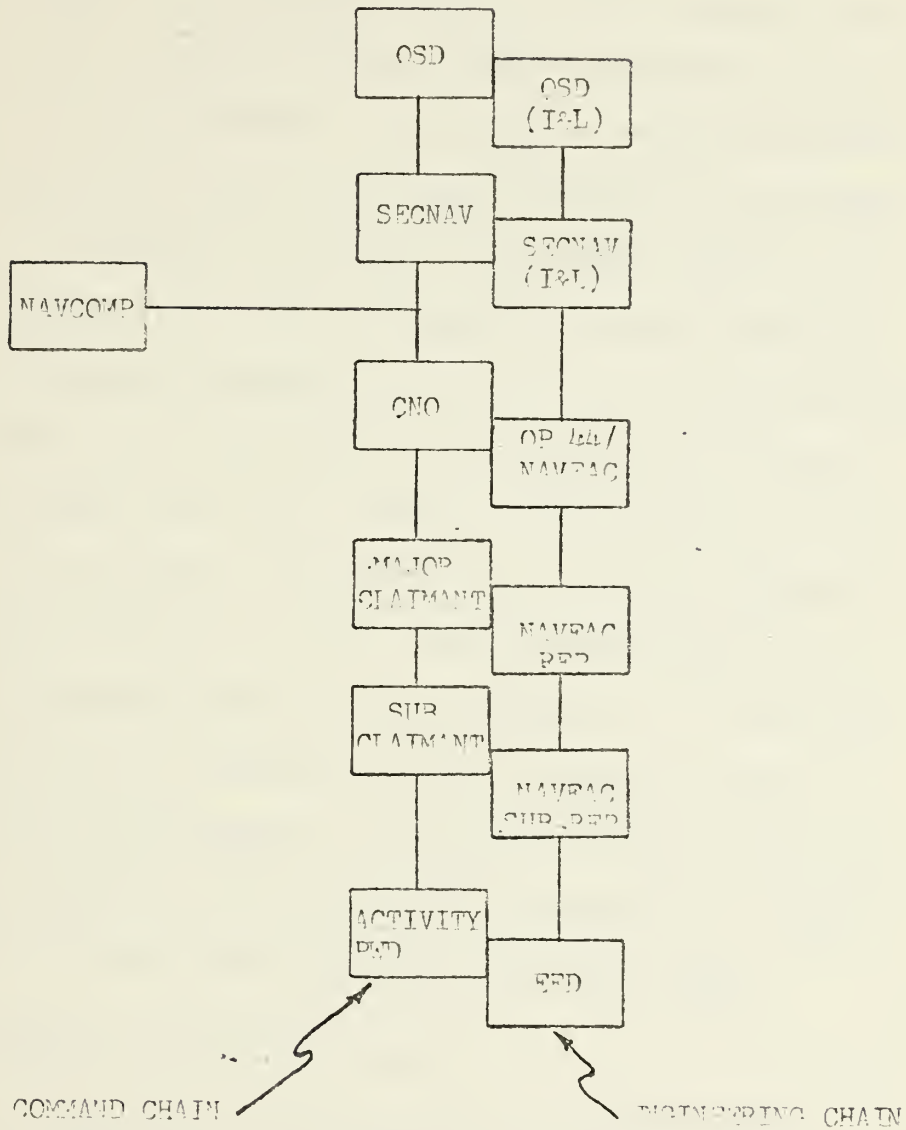


FIGURE 2 (25)

2.13 The Civil Engineer Corps

The U.S. Navy has several major staff career fields for Officers such as the Medical Corps, Supply Corps, and Civil Engineer Corps (CEC). The officers that comprise the CEC are almost exclusively graduate engineers and a few architects. This Corps has several functional areas of responsibility into which almost any specific job assignment could be categorized. They are: Public Works Management, Construction Contract Supervision, Construction Battalion Operations (Seabees), Engineering Management (within the Naval Facilities Engineering Command) or as a Staff Officer (on a non-Naval Facilities Engineering Command Staff). For example, each organization represented by a box in figure 2 would have one or more Civil Engineer Corps Officers attached. As can be seen the Civil Engineer Corps Officer is the common thread that runs through all U.S. Navy facilities maintenance and construction efforts. During his first ten to twelve years of assignments a typical Civil Engineer Officer may have billets in three or even four different categories. It need be emphasized that each and every billet is somewhat unique.

2.14 Civil Engineer Corps Officer School

Newly commissioned Civil Engineer Corps Officers attend the Civil Engineer Corps Officer School (CECOS) for eight to twelve weeks prior to reporting to their first duty station. At CECOS they all receive general public works indoctrination, and then each receives specialized training for the category of duty he will report to.

In the last few years CECUS has developed a two week mid-career course which is designed for CEC Officers with approximately seven to nine years of active duty.⁽²⁶⁾ It is planned to send all CEC Officers to this course as schedules permit.

2.15 Post Graduate Education

It is the objective of the Chief of Civil Engineers to see that all CEC Officers who desire post-graduate education and who can meet graduate entrance requirements, will have the opportunity.⁽²⁷⁾ In addition an extensive survey of all CEC billets has been conducted to determine which billets require post-graduate training. These billets have been coded and every attempt is being made to send only CEC Officers with post-graduate training to these billets.⁽²⁸⁾

2.16 Reimbursable Public Works

Most facilities maintenance work done at large multi-activity Navy complexes, is done on a reimbursable basis. This is usually the case where more than one activity "owns" Class I and II property, yet there is only one Public Works Department or Center. In these situations the activity that "owns" the buildings reimburses the activity that performs the maintenance work for all direct costs plus an additional charge (usually a percentage of the labor costs) to cover indirect expenses and overhead. The number of Marine Corps installations with more than one or two customers that reimburse for maintenance work performed by the host is very small when compared to



the Navy, and nowhere does The Marine Corps have an "independent" public works service agency (Public Works Center) of which the Navy has eight.

2.17 Public Works Department Organization

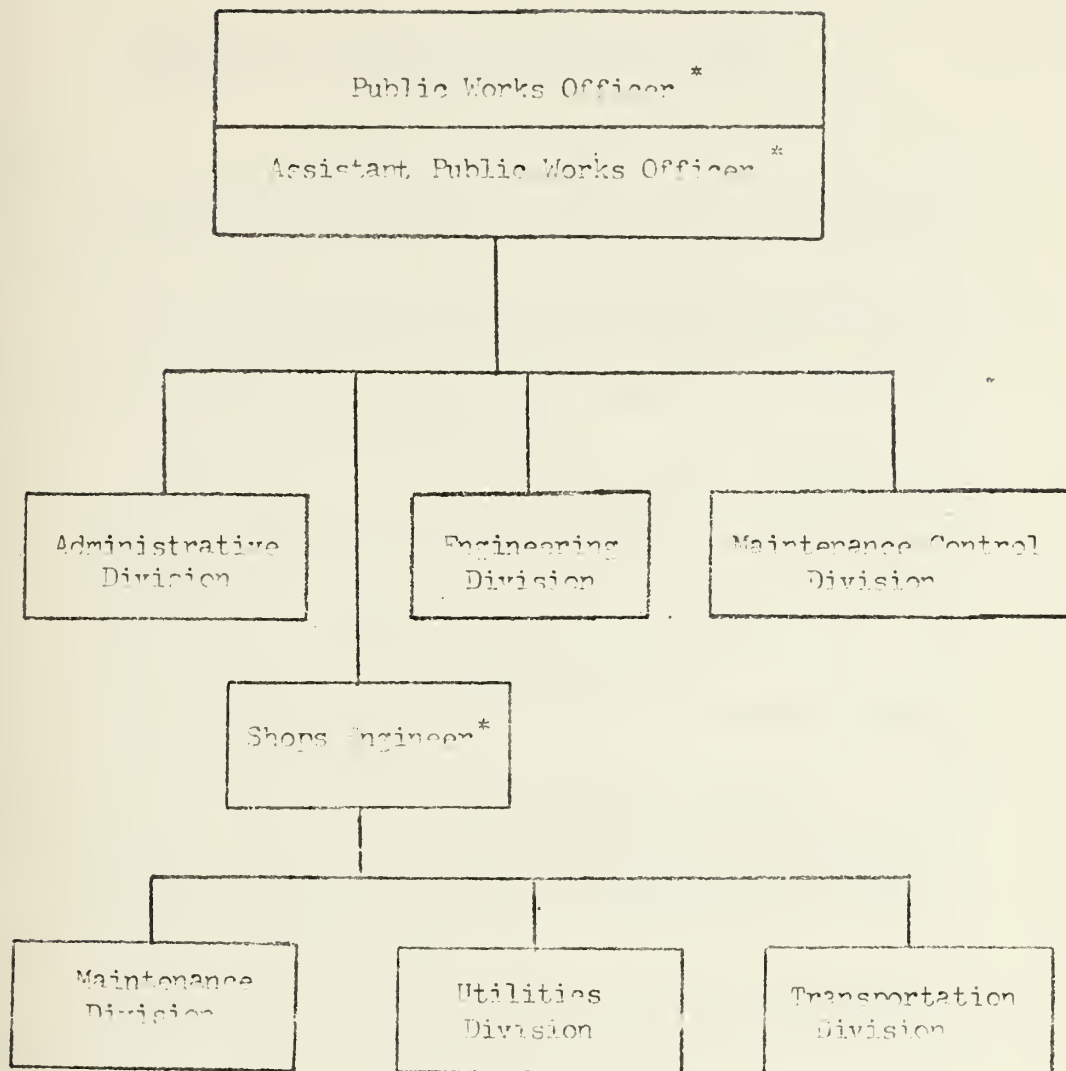
Figure 3 illustrates a typical Navy Public Works Department organization with the military billets identified. Three Civil Engineer Corps Officers were used on this illustration. Navy Public Works staffing criteria applied to a base of similar statistics as Camp Lejeune would indicate three Civil Engineer Corps Officers. (29)

2.2 NAVY PUBLIC WORKS PROCEDURES

With the above environment in mind, specific Navy facilities maintenance procedures will be reviewed.

2.21 Work Input

All work input, including but not limited to facilities maintenance work, originates from public works personnel, primarily inspectors; phone calls or written customer requests; fire or other command inspections; or higher authority. These requests all come to the Work Reception and Control Branch of the Maintenance Control Division. All work done in support of facilities maintenance is assigned to one of the labor class code categories shown in Figure 4. The two digit number on the left is used as shorthand for the definition and is even used on the individual workers' time card, along with the job order number.



* Denotes Military Billet

NAVY PUBLIC WORKS DEPARTMENT (STANDARD)

FIGURE 3 (30)



LABOR CLASS CODES FOR NAVY PUBLIC WORKS

New Code	Description
01	Service Work - All productive non-emergency work performed under emergency/service authorization which is 16 hours or less.
02	Emergency Work - All labor required to correct or repair a condition caused by a breakdown or an emergency including all labor subsequently authorized on a Minor Work authorization or Specific Job Orders as well as that portion authorized by an Emergency/Service Authorization.
03	Dynamic Equipment Inspection/Service (DEIS) - All labor expended by Groups II & III personnel while performing dynamic equipment inspection and service.
04	Standing Job Orders - Not Estimated - All productive labor that is authorized on a standing job order and has not been estimated.
05	Standing Job Orders - Estimated - All productive labor that is authorized on a standing job order and has been planned, estimated, and scheduled.
06	Minor Work Authorization - All productive labor authorized on a minor work authorization.
07	Specific Job Orders - All productive labor authorized on a specific job order.
40	Rework - All labor used in the correction of faulty work on the part of the Public Works Department, regardless of the code previously applied.
41	Supervision - All Group IVa personnel, and that part of a leader's time spent on supervision.
42	Shops Indirect - Groups II & III not directly chargeable to productive work which includes the schedulers and shop planners; also, labor spent in <i>maintenance and repair of shop equipment and power tools</i> ; also, time expended by non-graded Public Works personnel on material handling when such labor is not chargeable directly to a job. Labor expended by Groups II & III personnel in <i>cleaning up their work area</i> , excluding work of the regular janitorial force.
43	Allowed Time - All non-productive time expended on official business; waiting for material, tools, parts, equipment, transportation, etc.; administrative leave, excused tardiness and time loss because of inclement weather; time spent awaiting work assignment.
44	General Office and Clerical - Graded personnel who are on the roster of the Maintenance or Utilities Divisions but not those graded personnel assigned to the Maintenance or Utilities Divisions who are on the roster of the Administrative Division.
45	Leave - All approved absences for sick, annual, and military leave, holiday pay, terminal leave, jury duty and all other leave for which pay is received.

SUMMARY OF MAINTENANCE AND UTILITIES DIVISIONS LABOR CLASS CODES

2.22 Screening of Input

The Work Reception and Control Branch makes a first screening to sort out "illegal" work, emergency work (LCC-02) and service call work (LCC-01). "Illegal" work is returned to the requester. Emergency and service work is first recorded and then has a cost account affixed and finally is forwarded to the shop for accomplishment. Costs for these categories of work are accumulated against a standing job order (heading 2.25) for each category of facility.

The next screening that takes place on the remaining requests is to determine if this requests duplicates, in part or total, any others on file or in process. (Inspector generated work should not contain any duplications because the inspector is to check the building's file prior to his inspection). The remaining work is categorized by size: minor work (LCC-06) or specific work (LCC-07) and by relative urgency of need. New construction or alteration work is sorted out for special handling. Figure 5 illustrates conceptually the flow of work through the system from first input to accomplishment.

2.23 Minor Work Job Orders

The size of minor work job orders (LCC-06) is locally determined, but usually ranges from sixteen to forty manhours and less than \$500.00 in total cost. Usually they are also limited to two different crafts. Once a decision is made to go ahead with a particular minor work job order, it is planned and estimated using Engineered

FLOW OF NAVY PUBLIC WORKS WORK REQUESTS

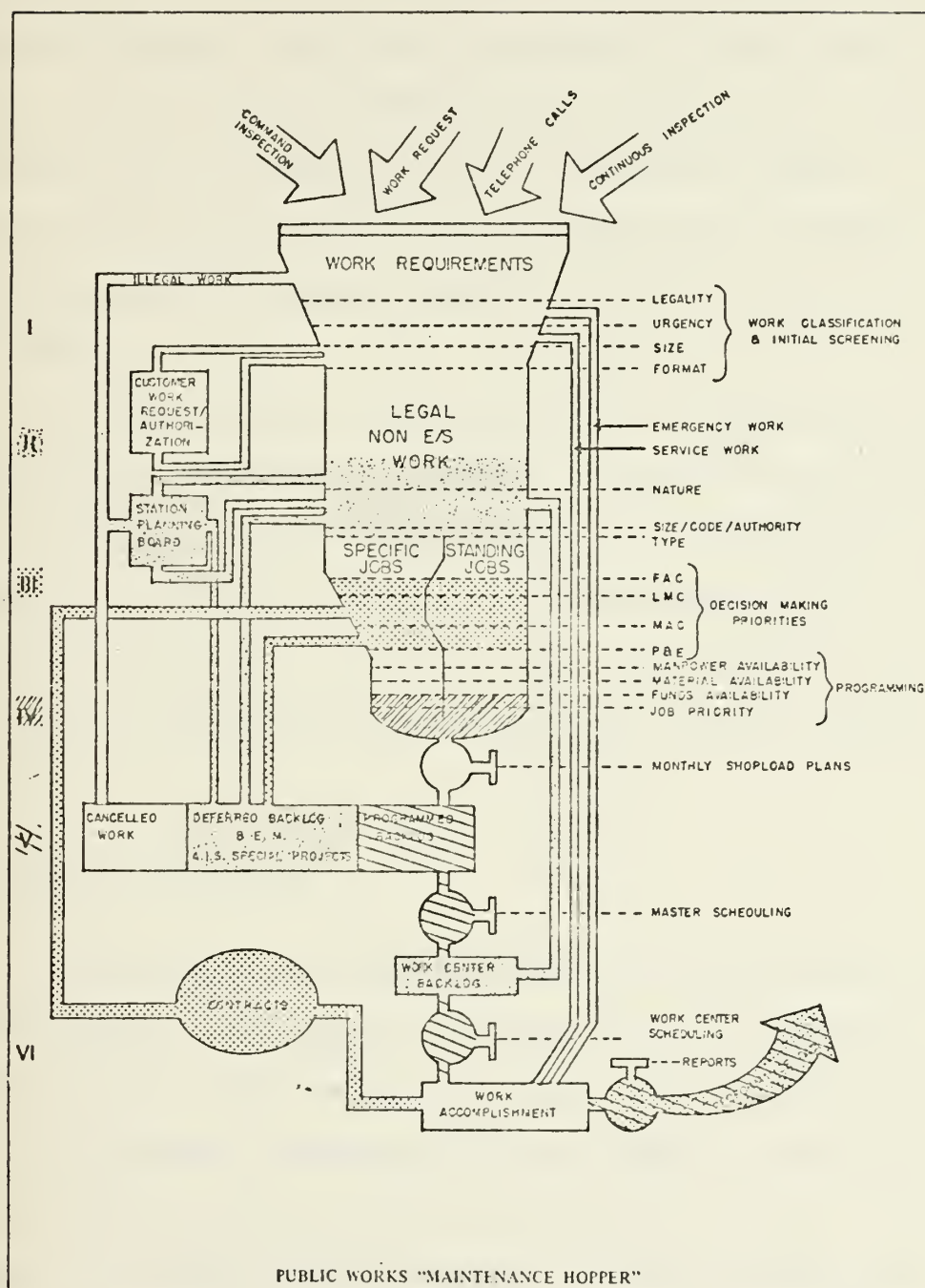


FIGURE 5 (32)

Performance Standards. Then it is programmed into a schedule by the Maintenance Control Division. Normally a small percentage of the available productive labor hours are set aside for minor work job orders. As the backlog of uncompleted minor work job orders grows or shrinks there are periodic "drives" to allocate a larger or smaller portion of the available hours to minor work job orders. Costs are accumulated against a standing job order for each category of facility.

The minor work is a convenient tool to accomplish relatively small straight forward jobs. Customers can understand that it may take considerable time to obtain materials, and schedule men for a large job, but it is most difficult and frustrating for them to wait months for a small job of minor work size. This is why the minor work job order can and should be an effective, customer pleasing tool.

2.24 Specific Job Orders

"The specific job order authorizes the accomplishment of a specific amount of work that is carefully planned and estimated, scheduled and for which individual job costs are desired for financial and performance evaluation."⁽³³⁾ Any change in scope is to be processed in the same manner as the original job order. A formal request for a change in scope amendment is made by the shops to Maintenance Control, citing the reason for the request, and the request is then evaluated and estimated. If approved, the amendment is issued.

The minimum standard for applying EPS is that seventy-five percent of all specific job orders (LCC-07) are to be estimated using EPS.⁽³⁴⁾ This criteria is also evident in the "Model Public Works Criteria"¹ as one of the check points a reviewer is to make.

All specific job orders once planned, estimated and approved are programmed into the short range schedule plan (the next three months) or the long range schedule plan (three to twelve months) depending upon urgency, material, availability and manpower/craft-man availability. Jobs are generally sent to the shops (production control branch) in one month blocks. The production control branch does the remaining detailed scheduling.

2.25 Standing Job Orders

"Standing job orders include all work that is highly repetitive and on which accumulated costs are all that is desired."⁽³⁵⁾ These job orders are usually issued for the entire fiscal year. Standing job orders come in three basic types: estimated (LCC-05), unestimated (LCC-04), and Dynamic Equipment Inspection/Service (DIES) (LCC-03).

2.251 Estimated Standing Job Orders. These are job orders such as grass cutting for which reasonable estimates of the manhours required and cost can be made. EPS are used in the estimates if at all possible.

¹ To be awarded a certificate as a Model Public Works Department, a Department has to be nominated by an EFD and then validated by NAVFAC. Activities having this award are recommended as a "show place" to other activities and agencies. See Appendix A for Model Public Works Department criteria.

2.252 Unestimated Standing Job Orders. These are job orders for which reasonable and meaningful estimates can not be made. The standing job order against which service work (LCC-01) costs are accumulated is a good example. It would be impossible to estimate the hours required and costs of twelve months of service calls that have not yet occurred. Snow removal might fall into this category since the exact amount of removal required cannot be forecast.

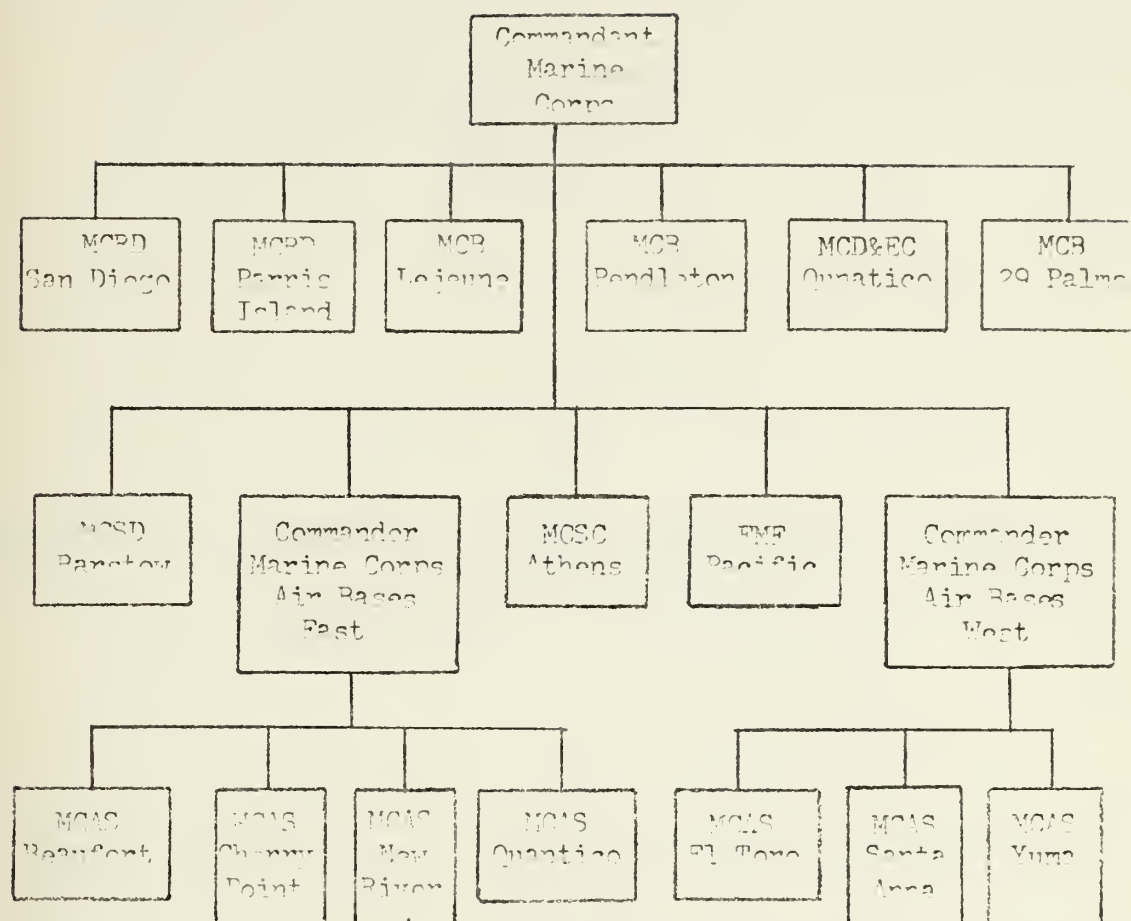
2.253 Dynamic Equipment Inspection Service Job Orders. The DIES standing job order (LCC-03) is unique. It is a job order for a certain piece or category of mechanical equipment which is to be inspected and serviced on a scheduled basis. Central air conditioning plants, sump pumps, air and refrigeration compressors are good examples of DIES categories. These job orders are estimated using EPS and usually issued for the whole fiscal year. The Maintenance Control Division keeps an individual card on each piece of equipment. When an inspection is due the Maintenance Control Division sends the card to the appropriate shop who sends a man out with the check card to do the inspection and service. Upon completion of the inspection and service the card is returned to the Maintenance Control Division who keeps it until the next cycle is due. Maintenance Control Mechanical Inspectors are expected to evaluate the effectiveness of the DIES job orders and craftsmen during their Controlled Maintenance Inspections of buildings. This, of course, is in addition to the craftsmen and his foreman having responsibility for the quality of DIES work.

3.0 MARINE CORPS PUBLIC WORKS

3.1 The Environment of Marine Corps Public Works

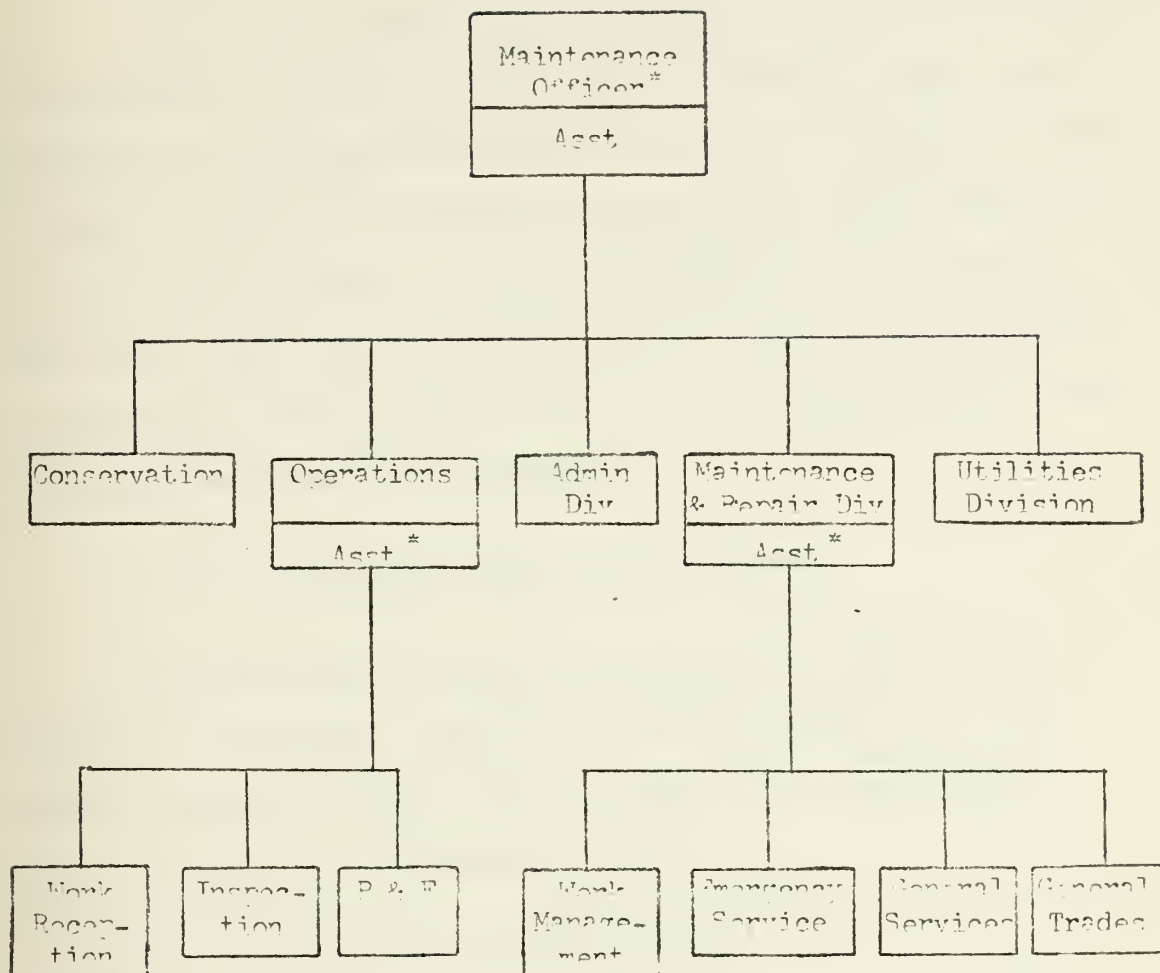
The Marine Corps framework is quite different and simpler, primarily because the Marine Corps is so much smaller. (See sub-heading 4.7). Operational command and facilities maintenance money for Marine Corps Bases, Supply Depots, Training Commands, etc. flows directly from the Commandant of the Marine Corps (CMC) to an individual activity with no intervening commands, yet the facilities maintenance money for Marine Corps Air Stations (MCAS) goes down the chain illustrated in Figure 6. MCAS used to receive their facilities maintenance money from the Navy until 1971. The air stations are the only Marine activities located in the United States, which do not deal directly with CMC on facilities matters, but go through the one intervening command.

Marine Corps Air Stations are also different from other Marine activities as far as Public Works organization and procedures are concerned. Navy Civil Engineer Corps Officers, are the Public Works Officers at Marine Corps Air Stations, but at all other Marine Corps activities, Marine Officers are the Public Works Officers (MC,BMD). At Marine Corps non MCAS activities, Civil Engineer Corps Officers, are in charge of the Planning and Engineering Design Division (MC,PWD) only. (See Figure 7). Navy Public Works procedures are also followed at Marine Corps Air Stations.



MAJOR ACTIVITIES OF THE UNITED STATES MARINE CORPS

FIGURE 6 (36)



* Denotes Military Billet

BASE MAINTENANCE DEPARTMENT
(LARGE MARINE CORPS BASE)

FIGURE 7 (32)

3.11 Military and Civilian Relationships

In Public Works Departments (MC, FMO) at Marine Corps activities, excluding MCAS, civil service employees and military officers occupy positions and relationships different than those at Navy Bases. Figure 7 shows the military and civilian positions in the Camp Lejeune Public Works Department (MC, FMO). As can be seen there are two instances where Marine Corps Officers are assistants to civil service employees. A comparison of this figure and figure 3 will show that in Navy Public Works Departments this does not occur.

3.2 Camp Lejeune Public Works Procedures

The facilities maintenance procedures or system at Marine Corps Base Camp Lejeune, North Carolina will be described in this heading. Organizationally it does not differ from the standard Marine Corps organization shown in Figure 7.

3.21 Service Calls and Minor Work Job Orders

Camp Lejeune has a work reception branch located within the Maintenance Control Division (MC, OPS Div.). At this branch all requests are received by phone, guard mail, or from Public Works personnel. Emergency requirements (LCC-02) (Figure 4) are immediately sent to the shops for accomplishment. The next screening is for service call work which is defined as any minor repair which would appear to take less than sixteen manhours but is not an emergency. These deficiencies (LCC-01) are described on a service call form and dropped

into a holding folder for the respective building. The above categories of work are similar in every respect to the Navy's. The handling of the LCC-01 service calls is different. (38)

The next larger size jobs, also of a non-emergency nature, are called "minor work" LCC-06 (MC,LCC05). The size limits are locally set but normally are jobs requiring between sixteen and forty manhours, and no more than a specified dollar limit, approximately \$500.00. At Camp Lejeune minor works are estimated by the Maintenance Control Division (MC,OPS DIV) as to the estimated manhours required, by work center, along with a total cost. They are written in the same format as a specific job order; assigned cost accounting data, have a control number affixed and are issued to the shops. All work centers in the Maintenance Division (MC,M&RD) are responsible for completion of minor work job orders, (LCC-06) within four weeks of the date the Maintenance Control (MC,OPS) issues them. A minor work is considered fill-in work for the first three weeks it is issued. If a minor work is not completed within three weeks it is then put on production control's (MC,WMB) weekly shop schedule to insure its completion by the fourth week. Once the minor work is issued it is entirely the shops responsibility for material, labor, cost and labor control, and scheduling. (39)

3.22 Cyclical Maintenance

What facilitates the different handling of LCC-01's is a new category of job order developed at Camp Lejeune called a cyclical maintenance job order. These job orders resulted from a decision in

1963 to incorporate a preventative maintenance program into the existing controlled maintenance program. Prior to the controlled maintenance program, Camp Lejeune operated on the "area man" concept in that each parent shop assigned men to specific geographic areas. Under this program, each parent shop received requests from "customers" by telephone and relayed the information to their man in the problem area for accomplishment. The "area man" also responded to personal verbal requests from "customers" in his area. (40)

3.221 Cyclical Maintenance Implementation and Results. A detailed description of how the cyclical maintenance program was implemented at Camp Lejeune in 1963 may best give a reader a feeling for cyclic maintenance. The following synopsis of the implementation and results was written by the Public Works Department (MC,FMO) at Camp Lejeune.

"1. First Cycle. The steam and plumbing system in barracks were selected for the pilot project. Initially, the inspection Branch made a detail inspection of the systems and the Planning and Estimating Branch prepared a specific job order to accomplish the work. There was considerable work required on each building. The job was scheduled and accomplished.

2. Second Cycle. The inspectors did not make an inspection prior to the second cycle. The job order was prepared and a check list of the individual tasks on each building was attached. The material list was based upon the experienced gained from the initial cycle. The estimated time was based on each task requiring no more than .3 hour. The job was scheduled and accomplished.

3. Succeeding Cycles. Records were maintained of time and material for several succeeding cycles. It was found that the requirement for labor and material diminished for each cycle. It was also

found that a few tasks required slightly more than .3 hour, but the average task was much below .3 hour. The exceptions were discussed with representatives from Headquarters, Marine Corps. It was determined that the correct description for this type of maintenance should be cyclic maintenance and the time limit of thirty minutes per task be applied. Deficiencies which were found that required more than 30 minutes would be noted on the check sheet (part of job order) with complete information to prepare a follow-up job order for minor work without anyone having to visit the site for further information.

4. Analysis. An analysis was made of each completed job order. It was found that the labor and material gradually diminished and became relatively consistent for each cycle. From this data, an "Engineered Performance Standard"¹ was developed for the cycle.

5. Results of Program

- a. Emergency service calls have been greatly reduced.
 - b. Ability to operate with fewer inspectors by utilization of data feedback on check sheets as a guide during Controlled Maintenance Inspections.
 - c. More efficient use of manpower in shops, in that, the crews work on a schedule from building to building with material available on site.
 - d. Ability to maintain a higher standard of maintenance at less cost by the timely repair of minor deficiencies before they develop into major ones.
 - e. Material available as a result of sufficient lead time.
 - f. Promotes good customer - Base Maintenance relationship. (41)
- Appendix (B) is a copy of craft check off sheets.

It is relevant to recognize that the larger the number of buildings on one cyclical job order (such as barracks), the more accurate the "Engineered Performance Standard" for that cycle will be. This is true because the high and low variances from the estimates which occur will tend to offset each other.

¹ The term Engineered Performance Standard (EPS) as it is used here, is not precisely the same as the Navy's.

3.222 Accounting for Labor. Cyclical job orders are issued on a six weeks, eight weeks or quarterly basis depending upon the type of work. Technically they are issued as estimated standing job orders LCC-04 with the 04 appearing on the job order and the craftsman's time card. The computer, however, picks up LCC -04 labor hours; reported on standing job orders issued for less than twelve month periods; and converts them to LCC-07 (MC,LCC-05) for the monthly manpower summaries and LCC breakdowns. The maintenance Division (MC,M&RD) treat these job orders like specific job orders LCC-07.

3.223 Summary. In summary then, the cyclical Maintenance Program is a Preventative Maintenance (PM) program for buildings just as the DEIS program (LCC-03) is a PM program for equipment with moving parts. It is one of the most important features of the whole Camp Lejeune Facilities Maintenance System. Cyclical Maintenance job orders account for approximately seventeen percent of the total direct labor hours worked by the Maintenance and Repair Division at Camp Lejeune.⁽⁴²⁾

3.23 Long Range Maintenance Plans and other ADP Applications

Camp Lejeune makes extensive but intelligent use of automatic data processing in inspection, long range maintenance plans, Type "A" Annual Inspection Summaries and for budgeting.

3.231 Long Range Maintenance Plan. Each Marine Corps Base is required to have a long range maintenance plan which is to cover three to five fiscal years (depending on local determination) beginning with the

budget year. (43) This long range plan is to contain only work of a specific nature; work that has a beginning and an end. The work may recur over a period of time, but is not to include work of a repetitive nature such as grass cutting, service work, preventative maintenance of mechanical equipment or cyclic maintenance of facilities. It is to include work such as exterior painting, sealcoating of asphalt pavement, and reroofing of buildings.

Many of the projections for the long range maintenance plan are based upon a painting cycle. Normally all necessary interior maintenance and repairs (within the activity Commanding General's funding authority) are made at the time complete interior painting is done. Exterior repairs are made when the exterior is painted. At Camp Lejeune interior painting is basically on a four year cycle and exterior painting on a three year cycle. The long range plan for two other important work categories: roofs and roads, are based on annual visual inspections upon which maintenance requirement projections are made (as opposed to a pre-planned cycle). (44)

At Camp Lejeune this long range plan is produced as an ADP listing (Figure 8) of each facility and structure at the activity. The total estimated maintenance and repair cost in dollars, together with a projection as to which year these dollars will be needed, is given for each facility. This plan is updated annually in July (the first month of the new fiscal year) and then the print out is made. When work cannot be accomplished during the year in which it is planned, it normally becomes a backlog item with the cost to correct the deficiency in the "estimated cost column." No projection is made

*CAT. CODE	*BUILDING DESCRIPTION	*ESTIMATED COST	*RECORD	*STATUS	*PROJECTED
*CODE	*NUMBER	*COST	*EXT. INT.	*EXT. INT.	*EXT. INT.
*****	*****	*****	*****	*****	*****
74002 7100	403 LOCATION EXCH	\$770	\$500	62 69 X	73
74002 7100	403A LOCATION EXCH	\$11	\$50	NPR 69	73
74210 7100	404 EM BKS W/L MESS	\$3,850	\$3,300	SH71 69	74
44210 7100	409 GEN WHSE/RI	\$1,210	\$770	NPR 69	73
72210 7100	400 EM BKS W/L MESS	\$3,850	\$3,300	71 69	74
72210 7100	407 EM BKS W/L MESS	\$3,850	\$3,300	71 69	74
72210 7100	403 ACU/GEN INS BLD	\$6,000	\$5,225	67 69 X	73
72210 7100	407 EM BKS W/L MESS	\$3,850	\$3,300	71 69	74
72210 7100	410 EM BKS W/L MESS	\$3,850	\$3,300	69 69 X	73
72310 7100	411 EM DINING FAC	\$16,500	\$5,225	66 69 X	73
44210 7100	412 EM BKS W/L MESS	\$3,850	\$3,300	70 69	73
44210 7100	413 GEN WHSE/RI	\$1,210	\$770	NPR 69	73
21130 7100	414 G/E FLD H-T SHP	\$1,210	\$770	NPR 69	73
72210 7100	415 EM BKS W/L MESS	\$3,850	\$3,300	69 69 X	73
61072 7100	416 BATT HQTRS	\$1,925	\$625	SH70 69	73
72210 7100	417 EM BKS W/L MESS	\$3,850	\$3,300	71 69	74
44210 7100	418 GEN WHSE/RI	\$1,210	\$770	NPR 69	73
61072 7100	419 BATT HQTRS	\$1,925	\$625	71 69	74
72210 7100	420 EM BKS W/L MESS	\$3,850	\$3,300	71 69	74
55010 7100	421 DISPENSARY	\$1,650	\$935	67 67 X	73
72210 7100	422 EM BKS W/L MESS	\$3,850	\$3,300	71 69	74
61071 7100	423 KFG FQTRS	\$2,640	\$800	67 69 X	73
72310 7100	424 EM DINING FAC	\$6,000	\$5,225	73 68	76
74005 7100	425 NCU CLUB	\$4,510	\$3,900	62 69 X	73
74005 7100	425A NCU CLUB STORGE	\$11	\$50	NPR 69	73
72210 7100	426 EM BKS W/L MESS	\$3,850	\$3,300	71 69	74
72210 7100	427 EM BKS W/L MESS	\$3,850	\$3,300	SH72 69	75
44210 7100	428 GEN WHSE/RI	\$1,320	\$500	NPR 69	73
55010 7100	429 DISPENSARY	\$1,210	\$770	NPR 69	73
44210 7100	430 GEN WHSE/RI	\$1,210	\$770	NPR 69	73
44210 7100	431 GEN WHSE/RI	\$1,210	\$770	NPR 69	73
44210 7100	432 GEN WHSE/RI	\$1,210	\$770	NPR 69	73
44210 7100	433 GEN WHSE/RI	\$1,210	\$770	NPR 69	73

FIGURE 8

as to when the backlogged work will be accomplished. Other features of this ADP listing are that it contains the category code of each facility, the cost account to which any work in the facility is charged, and a record of when the last specific maintenance was performed, by fiscal year. In running the program the computer will total the dollars of backlogged work, the total cost of projected FY 73 specific maintenance, FY 74 specific maintenance, etc., which has been identified as of the updating. (45)

3.232 Budget Preparation. It is easily seen that this print out provides a tremendous amount of invaluable, readily available information for input into budgets and the mid-year reviews. As a side benefit it has been found that this listing provides ready reference answers to many inquiries from building occupants and others as to when a building was last renovated, the cost of the renovation and when it is again programmed for renovation.

3.233 ADP Aided Inspection. Each July, after the long range plan is updated, a different program is run using the same data and the computer produces a form similar to Figure 9 for each facility listed on the long range maintenance plan. The inspector takes this form into the field on his inspections. This form contains the same updated information that was on the long range maintenance listing and the inspector merely enters all deficiencies not previously recorded, together with an estimate of the cost. In addition, the inspector ascertains whether the fiscal year projection of repairs and painting is valid or should be changed.

INSPECTOR WORK SHEET CAMP LEJEUNE MCB

TYPE A ANNUAL CONT. OF INSPECTION PAGE 2507
 REG. UNIT 260 SELLER/SUPP. UNIT DATE 20 APRIL 1973 *9.1.73*
 CAT. CODE 841-50 CAC 76FJ

ITEM	PRIOR PERIOD	12 MONTH PERIOD	PROJECTED DEFICIENCY %	AMOUNT	BACKLOG AMOUNT	REFF DESCRIPTION
CARPENTRY - INT			50		<i>WV</i>	
EXT			50			
ROOF			50			
MASONRY			50			
PAINT - INT	ND		50	73	50	
EXT	ND		50	73	50	
METAL			50			
ELECTRICAL			50		<i>WV</i>	
MECHANICAL			50			
OTHER						
TOTAL					<i>0</i>	
						CODE 1 CODE 2 CODE 3

FIGURE 9

Before adopting the procedure, whereby the computer printed the information on the inspector's work sheet, it was necessary for the inspector to make a search of the facility history files and long range plan for the information, and enter it by hand. Now when the long range plan needs updating, the comments and costs from the inspector's work sheet form the input. Costs may be adjusted by an individual change input to the data base or maybe increased by a blanket input, adjusting all costs on a scale to keep up with inflation. (46)

3.234 Type "A" Annual Inspection Summary. The Type "A" Annual Inspection Summary is submitted January 1. It includes all specific maintenance and repair work identified and programmed for accomplishment in the current fiscal year or prior fiscal years which has not been, and will not be, accomplished as of 30 June of the current fiscal year, due to lack of funds.

The correlation of the Type "A" Annual Inspection Summary with the long range maintenance plan print out is simple and direct. For each "X" in the "backlog status columns" on the print out there should be one entry with the same costs on the Type "A" Summary. The Type "A" Summary need only be adjusted for changes made subsequent to the long range print out. Facilities special projects and certain additional requirements are added manually. The Type "A" Summary is required to be submitted with like facility category codes grouped. This too is facilitated by the print out which contains the codes.

3.24 Material Ordering and Job Scheduling

3.241 Material Ordering. At Camp Lejeune the Maintenance Control Division (MC, OPS DIV) prepares material lists by work center, during the estimating procedure on specific job orders. The shop planner in the Production Control Branch (MC,WMB) reviews the material lists for accuracy and forwards to shop stores for acquisition. Shop stores marks the items on the lists either "draw from stock" or "ordered on requisition number "xxxx" as appropriate, and returns the lists to Production Control (MC,WMB).

Specific job orders are similar to the Navy ones in that they are usually one time requirements requiring over forty manhours and costing over \$500.00. The estimated quantities and cost of materials required will be indicated by the planner and estimator (P&E). If a specific piece of equipment is required or desired it will of course be clearly identified by the P&E.

Specific job orders are prepared only after a positive decision has been made that the work will be accomplished. It is either in the annual maintenance program or is of sufficient urgency to force another planned job out of the program. This implies that the work is of sufficient priority that manpower and dollars will be made available. (47)

3.242 Job Scheduling. Once a facilities maintenance specific job order is prepared it is forwarded to the Production Control Branch (MC,WMB) of the Maintenance Division (MC,M&RD) where all further work programming and scheduling takes place. Programming is based on urgency of

need, estimated material availability dates, craft manpower availability, and weather or seasonal considerations. Production control's (MC,WMB) weekly master schedule includes specific job orders for the week, minor works over three weeks old, other estimated standing job orders with work scheduled, and cyclical maintenance job orders.

At Camp Lejeune the Work Management Branch has two maintenance schedulers and three shop planners. These five people do programming and scheduling for all Maintenance Division (MC,M&RD) work. There is also individual work center scheduling to fulfill the requirements set by the Work Management Branch. The Maintenance Division (MC,M&RD) has approximately 530 employees and performs maintenance on 2510 buildings and structure plus 3751 family housing units. These housing units and buildings are dispersed over 116,000 acres at Camp Lejeune. (48)

3.25 Maintenance Control Division (MC,OPS DIV)

Just as in the Navy System, the Maintenance Control Division (MC,OPS DIV) is a "nerve center" for the Public Works Department (MC,FMO). At Camp Lejeune it has a GS13 as Division Director with a Marine Corps Major as assistant. There is a Work Reception Branch with a supervisor and two clerks, an Inspection Branch with a supervisor and four inspectors, and a Planning and Estimating Branch with a supervisor and seven P&E's.

These eighteen personnel perform all inspections on 2510 buildings and structures as well as unnumbered Class II property such as roads. They do all planning and estimating on the 3751 housing units



in addition to the 2510 buildings, structures and roads. They perform all work reception services during normal working hours. They formulate the annual maintenance program which is a list of all specific job orders planned for accomplishment during the year based on manpower, dollars, craft mix available, etc. In addition the supervisory inspector performs all acceptance inspections on contract work which the Engineering and Planning Division (MC,PWD) has awarded. As might be expected this Division is deeply involved in facilities budgeting, prepares the Type "A" Annual Inspection Summary, and the Long Range Maintenance Plan. (49)

This Division is responsible for many of the innovations in the Division and Department. These are impressive accomplishments for a Division of eighteen people.

3.3 Inspector/Planner/Estimator

While almost all Marine Corps Public Works information in this thesis is based on that received at Camp Lejeune and at CMC in Washington, D.C., a tour and interviews at the Marine Corps Development and Education Command, Quantico, Virginia revealed an additional innovation in facilities maintenance. At Quantico they have abolished (after receiving begrudging permission of the Civil Service Commission) separate positions of Inspector and P&E. All are now Inspector, Planner and Estimator. They now all receive the higher pay scale of the former P&E. In spite of the increased cost per man it is felt that increased productivity and savings from work overlapping will more than compensate.

After combining the positions, all facilities including roads, and utilities were divided up geographically with each inspector receiving a share. He is now responsible for all inspections and estimates on facilities in his area. If he does not feel competent to say whether a roof needs replacing or not, but suspects there is a problem, then it is his responsibility to ask one of the other Inspector-P&E's who has competence in this functional area for assistance. The managers at Quantico anticipate a lot of inspection and estimating assistance will be needed at first, since each Inspector or P&E was formerly a functional specialist. Also, inspectors were not previously trained in estimating. (50)

3.4 Perspective

The above headings have been primarily intended to describe only those aspects and procedures of Marine Corps Public Works which differ from the standard Navy procedures. This distorts the true image, in that there are many other areas which both use the same systems and procedures. However, this thesis is designed to explore procedural innovation for Navy Public Works by comparing it with the Camp Lejeune systems, and therefore only the differences are the core issue.

4.0 PUBLIC WORKS PROCEDURES ANALYSIS

The major points of contrast between the Navy and Marine Corps facilities maintenance procedures are listed below and each will be discussed in turn.

Navy	Marine Corps (Camp Lejeune)
A. Emphasis on using EPS, inspection and control	Emphasis on facilities maintenance
B. No cyclical maintenance	Cyclical maintenance
C. Budget preparation based on present year funding and backlogs	Budget projections based on long range maintenance programs (using computer), backlogs and present year funding
D. MCD orders materials in many PWD's	Production Control (MC,WMB) order materials
E. MCD does programming by month	Production Control (MC,WMB) does programming and scheduling
F. Military and civilian relationship, always military over civilian	Military and civilian relationships mixed
G. Long and complicated funding and technical advice chains	Short and unilinear funding and technical advice chains
H. Relatively low support levels for Class I and II property maintenance	Relatively high support levels for Class I and II property maintenance
I. Inspection separate from P&E also each done by functional categories	Inspection and P&E now combined in one person and grouped by geographical areas (Marine Corps Base Quantico, Virginia)
J. No ADP aided inspection	ADP aided inspection

4.1 Means vs Ends

Possibly the core issue, at least intellectually, is the first one listed. At Camp Lejeune the Public Works Managers feel that proper maintenance of facilities is the objective, and that inspection, control, engineered performance standards, scheduling, cyclical maintenance, ordering of materials, etc. are means or "tools" to reach the objective. They feel that the objective is supreme and that appropriate "tools" should be applied in appropriate ways. They continually look for innovation to simplify and improve results. It is hard to argue with the above, but these people are not "blue sky" theorists; they are successful practicing managers.

It is not contended that the Naval Facilities Engineering Command would say that the "tools" are the end sought. In fact the following is a quote from maintenance manual MO321 (the "Bible" of Navy Public Works):

"2.7 . . . When too much emphasis is placed upon procedures to achieve conformity, uniformity, or standardization, there is a tendency to lose sight of the main objectives. The objectives are obscured by over-zealous attention to procedures, forms, and reports. One of the prime objectives of maintenance management is to increase the productivity of the maintenance work force. The procedures and reports are merely tools to help attain this objective . . ." (51)

It is submitted, however, that the Controlled Maintenance System as it is practiced overemphasizes the "tools."

Many times managers can not easily measure what they would really like to measure (the productivity of a craftsman as compared

to what he is capable of producing, the optimum utilization of facilities maintenance resources, etc.), so they measure what is easily measurable (the percentage of job orders estimated using EPS, the variance between estimated and actual performance, the relative proportion of manhours in each labor class code, etc.). This is a reasonable management approach which can be helpful, but when a surrogate is measured the manager should not delude himself that he has measured what he was after in the first place.

4.11 Control, Control

The maintenance portion of the Navy Public Works System is entitled the "Controlled Maintenance System." The inspection procedures are called "Control Inspections" they are scheduled by a branch of the Maintenance Control Division which also has another branch within called the Work Reception and Control Branch. Scheduling within the Maintenance Division is done by the Production Control Branch. Almost all Navy Public Works forms, after giving the functional title, carry the words "Controlled Maintenance."

It is not contended that there were any diabolic intentions when these words were first chosen. Prior to the innovation of the Controlled Maintenance System there was no system, and people who saw the before and after, state that the transformation was a revolutionary improvement. It is, however, cogitated that due to the continued repetition of the word control, some may fail to recognize control as a "tool" and instead adopt it as an end.

In addition to the quotation in subheading 4.1, MO-321 also has the following to say about control.

"2.8.1 Complete Control. The application of complete control means that all of the methods described in this publication will be followed in principle and, for the most part, in detail.

"2.8.2.2 Basis of Determination. Although complete control is desirable, modified control is justified at some activities. The primary factor is whether the system will pay for itself. The number of persons required to control maintenance work must be in realistic proportion to the number of persons assigned to the maintenance work.

"2.8.2.4 . . . Medium (75-250 personnel in the Maintenance and Utilities Divisions) and large activities should always be under complete control. Small activities (30-75 personnel in the Maintenance and Utilities Divisions) are susceptible to complete or modified control;" (52)

It may seem like a small point, but it is concluded that the word "control" should be removed from many billets, manuals, and forms. Hopefully the words substituted can be more descriptive of what is desired, and less subject to interpretation.

If the word control remains, hopefully it will be used in the more modern management context of "feedback" whose primary aim is to improve operations and procedures based on the results observed.

4.12 Engineered Performance Standards

Camp Lejeune Public Works managers feel that attempting to apply engineered performance standards EPS to between seventy-five and ninety percent of maintenance estimates may not be cost effective. They feel that using EPS on assembly line or repetitive work and larger specific job orders is entirely appropriate. The Navy standard that

seventy five to ninety percent of LCC-07 work should be estimated using EPS may not be cost effective and may tie up more billets than should be allowed for estimating, when considering the overall shortage of billets.

In other words, it is somewhat akin to attempting to predict with stop watch accuracy, how long it will take to drive from one city to another and judging the success of the trip by how close the prediction was; when the success was really arriving at the destination in sufficient time to attend a meeting. To be sure a standard of some nature used to allow a reasonable driving time, but stop watch accuracy was not required nor the prediction (which also took time to arrive at) any more accurate than an experiential estimate. (i.e., On a Friday afternoon it usually takes about one hour to get to the meeting.)

It is an unsupported (by rigorous documentation) contention of the author that EPS as applied in Navy Public Works may very well be a depressant on productivity improvement; such as adoption of new technology, tools, and materials (see sub-heading 4.4); and competent craftsmen (see sub-heading 4.21). EPS applied to actual work, together with the allowances for travel, lost time, cleanup, etc., are quite liberal especially for good craftsmen. "Work will expand to fill the time allowed."¹

Certain aspects of human nature should also be examined, keeping mind that most P&E's were formerly craftsmen. If there is any significant variance in the manhours used, it is a requirement of the Controlled Maintenance System to ascertain why the discrepancy occurred.

¹ Parkinson's Law.

(i.e., Was the estimate wrong or did the shops use more time or materials than they should have?) The results may be an unintentional tendency on the P&E's part to be liberal with his manhour and material estimates, because as a result there will be very few discrepancy reviews made.

4.13 Labor Class Codes

Sometimes the effectiveness of a Navy Public Works Department is judged by the relative proportions of work done under each labor class code. While it is agreed that this may be significant, it should be remembered it is only one measure. The Camp Lejeune Public Works managers do review the work accomplished; broken down by labor class codes, to check performance and look for any unexpected shifts.

Another element may come into play as employees find out what criteria top Public Works Management judges performance by. If for example, they find that travel time (LCC-43) is being observed and viewed negatively then workmen and supervisors will migrate a portion of their travel time into productive labor class codes on their time cards. While on the surface this may appear harmless, since the total cost of a particular job is not changed, it could be serious. Accurate reports that show a lot of time spent waiting for transportation are the only way that additional transportation can be justified.

There may be a parallel situation develop with regard to P&E's. If, for example a Maintenance Control Director or Public Works Officer

wants to have ninety percent of his LCC-07 job order estimated using EPS. (This might be desired to "do better" than model public works criteria minimums). The chances are the P&E's may either apply EPS to work it should not be used on, or mark non-EPS estimates as having used EPS.

4.2 Cyclical Maintenance

Cyclical Maintenance is a key element to Camp Lejeune's successful program. One of the obvious manpower and energy cost savings by this program is transportation in support of non-emergency service calls. Another feature that produces substantial savings and improves customer relations is the absence of long time frames (many months or even years) between identification of deficiencies (non-emergency type) by a public works inspector and the time when the craftsmen show up to repair a series of relatively minor problems.

4.21 Non Cyclical Maintenance Illustration

There are critical problems associated with these time delays. A simple example follows: A deficiency identified by an inspector, (such as "replace six broken floor tile in room 201") several months before has now deteriorated to ten broken tiles. The craftsman has a job order that calls for him to replace six tile and allows him time judged by EPS to replace six. If he looks at the problem conscientiously and professionally he will replace all ten tiles, but in doing so, may spend two hours instead of the one and a half scheduled. Certainly a half hour will not seriously affect a

schedule containing thousands of hours per week, but it is a thirty-three percent variance and if all jobs were off even ten percent, havoc would reign in the Production Control and Maintenance Control Offices.

There are of course at least two other alternatives open to the craftsman aside from the preferred one above. He is allowed, within the Navy system, to request additional time due to changed conditions. Of course, his supervisor, an MCD authorizer, a clerk and the guard mail time and cost to prepare, estimate, reproduce, and deliver an amendment would consume well over a half hour of overhead time in addition to the half hour of additional work the craftsman will perform. (The reason a written amendment is required is so that the hours used do not exceed the hours estimated and EPS is once more vindicated.) Still scheduling adjustments will have to be made.

The other alternative for the mechanic is to do what he is told and "replace six tile in room 201." In following this course of action many things happen. First, the occupants of room 201 are displeased with the correction of the deficiency which an inspector identified many months before. Secondly, they are convinced that the Public Works Department does not know what they are doing. Thirdly, a good conscientious craftsman is being conditioned not to practice his trade to the best of his ability just do what he is told; no more, no less. Soon you do not have a craftsman.

Can not advantage be taken of all the experience gained in performance of maintenance on particular facilities year after year?

Combine this experience with a basic understanding of statistics, and with attempts to reduce lost time, energy and money (partially attributable to excessive transportation and paperwork). Next emphasize attempts to provide the customer a complete professional job and to utilize the professionalism and pride a skilled craftsman has. The obvious result of the above efforts would be to perform routine maintenance by cyclical job orders.

4.22 Accounting for Labor

There does not appear to be a major problem as to whether the work performed under these job orders is classified LCC-05 (estimated standing job orders) or LCC-07 (specific job orders). Arguments could even be made for LCC-03 or LCC-04. If it is desired to maintain historic comparability and be able to distinguish them from a true standing job order (grass cutting, for example) then they probably should be called LCC-07. If there is a great deal of discomfort with any of the above, the obvious answer is to create a new LCC for cyclical maintenance job orders, just as there is for DIES job orders (LCC-03).

4.23 Side Benefits

Some side benefits accrue from this program. Personnel or organizations who occupy buildings normally have someone designated as being responsible for the physical plant including policing, keys, access, etc. Under most conditions this person is the one that phones in service calls and emergencies that he observes, or are pointed out

to him. Under the cyclical maintenance system he normally calls in only emergencies, making a list of other minor problems. He knows approximately what date craftsmen will arrive to take care of these relatively routine problems at his building.

This procedure instills confidence in the customer that Public Works does care about, and can solve his routine maintenance problems, in a professional manner. Appendix "B" which the customer signs and dates along with the craftsman or his foreman also makes the customer more aware of facilities and their abuse, while creating a healthy interaction between craftsmen, foremen and customers.

The craftsmen and their foremen are also now partially utilized as inspectors, reporting back, in writing, any deficiency outside their craft or scope of responsibility.

4.24 Summary

The cyclical type job order facilitates routine building maintenance in a low cost, responsive, realistic manner and is recommended for adoption by the Navy. This does not mean that the specific job order will not continue to be an important "tool," nor does it mean that amendments to job orders should be abandoned; it merely means another "tool" has been added to the repertoire and recommends continuing efforts to find and apply the most appropriate "tools."

4.3 Budget Preparation

4.31 General

There are two basic aspects to budgeting. The first aspect is preparation, or the delineation of resource requirements, together

with justification in the form of a request for resources to carry out the mission. The second aspect is called allocation or execution and is an expenditure plan, based on the actual resources received as a result of the requirements request. This discussion will concern itself with the former aspect only since other areas of this thesis discuss effective expenditure of resources received.

4.32 Budgetary Environment

Because of relevance to discussions in sub-heading 1.22 and sub-heading 4.7 the following description of the budgetary process is presented. Normally the budgeting is an annual process concerning the two fiscal years succeeding the present one. Budget preparation in the Navy and Marine Corps is not merely a submission of requirements. Before the requests for budget submission are made to individual activities, Congressional Committees, the Office of Management and Budget (OMB), The Department of Defense (DOD), The Secretary of the Navy (SEC NAV), the Chief of Naval Operations (CNO) and Major Claimants have indicated intended support levels.

As an example: OMB based on discussions with Congressional Committees may indicate to DOD that their budget submission must be held to seventy-five billion dollars in fiscal 1975 regardless of what DOD feels it needs. Then DOD is responsible for two things. First, they divide the seventy-five billion dollars among the four Services and ask each to develop a budget within their respective portion of the seventy-five billion dollars. (What this really amounts to, in a before the fact sense, is the allocation aspect of

budgeting.) Each Service is also required to submit "important" requirements that cannot be accomplished within their portion of the seventy-five billion dollars. When totaled, the "allocation plan" plus the unfunded requirements form a true DOD budget request.

Each senior organization allocates dollars in turn, by organization and functions, down to individual activities. The activity (or intervening layer) proposes an allocation plus a list of the potential unfunded requirements. Based on these "budget" submissions, seniors may change their internal allocation, and of course they will forward the resultant unfunded requirements upward in hopes that they may be the recipient of an allocation change by their superiors due to the size and urgency of their unfunded requirements. Since there are thirteen Major Claims with a wide variety of missions, and large size range that exact budgeting procedures may already vary significantly.

There is distinct relevance between the above discussion and alternative two, (reduction in bases or individual facilities) as stated in heading 1.22. The dollars made available for facilities maintenance are not necessarily based on the requirements, but on how many dollars are available for facilities maintenance. The differences between the two can be very large.

Practically speaking, initial allocations of resources for facilities maintenance from superiors are, for the most part, proportional to the prior years funding allocation with minor adjustments for known mission changes, significant change in BEM, new facilities, etc. If an individual activity is successful in receiving additional

resources one year then they will probably continue to receive these additional funds (or proportion thereof) in the future. The above emphasizes the importance of consistently submitting strongly supported budgets (allocation plan and potential unfunded requirements). As can be observed the number of intervening allocations and reallocations by superiors could have serious consequences on the resources available to an individual activity, and will be discussed further in section 4.7.

4.33 Computer Assisted Facilities Budgeting

The utilization of a computer to assist in the formulation and printing of the long range maintenance plan is almost as good a "tool" as the long range maintenance plan itself. By this simple and direct computer usage, which also has an adjustment to allow programming of costs to meet inflation, Camp Lejeune has succeeded in knowing most specific predictable resource requirements in time to budget for them. Supporting their requirements to any on scene reviewers is simplified by merely touring the base with the reviewer to verify the accuracy of the printout. It is an impressive support document.

It appears that some visibility of backlog job orders may be lost on this long range maintenance plan printout. It may be possible to utilize the remaining columns on the right of the printout to place the specific job numbers of the backlogged work, to retain identity. This would have to be studied more thoroughly before implementation.

4.4 Material Requisitioning

The subject of material requisitioning is not of equal significance with cyclical maintenance or some of the other topics. It is of sufficient importance to point out a few of the factors. Probably the most significant argument that can be made for Production Control (MC,WMB) ordering all materials, is time savings; especially when shop store is out of a particular item desired. The shop man is in a much better position to substitute there and then, materials that are acceptable. The second most significant argument is that under this system a shop foreman can order the particular style of hardware or material that his men like to use, is easier to install, or lasts longer. If Production Control ordered all material for Navy maintenance one result might be more innovation and adoption of new products vice ordering the "old standard" that the P&E used to use when he was in the field ten to fifteen years before. It is believed this procedure would provide job enrichment to the Maintenance Division (MC,M&RD) personnel by placing them in a more responsible and job influencing position. The present Navy procedures do vary from activity to activity.

4.5 Scheduling

This particular discussion may be a little hard to understand without extensive background information, but the subject is fairly significant in Camp Lejeune's maintenance system. The main arguments favoring the Lejeune system are elimination of programming and sched-

uling being done in two places, with attending overhead savings. Co-ordinating schedules and feedback are two time consuming parts of the Navy's system. Also it is believed that Production Control (MC,WMB) is in the best position to balance a schedule. By this it is meant that they are the closest to the scene and can adjust schedules, priorities, craft mix better and faster to changing conditions. Job programming and scheduling by Production Control (MC,WMB) would concentrate all the scheduling responsibility in one place, with accompanying savings.

The Camp Lejeune time limit of four weeks for the shops to accomplish a minor work after issuance, is an excellent goal. Their system of formally scheduling them on the weekly shop schedule during the fourth week, in order to assure completion, appears to work very well.

4.6 Military and Civilian Relationships

This subject can be as large as anyone wants it to be and this thesis will not discuss the full range of arguments. However, it is intended to comment on the specific situations which occur in public works and restrict comments to this area. It is also not intended to address implications away from an individual activity department. It is acknowledged in advance that these comments may appear to be heresy to some, but it is felt that they must be considered. Figure 3 and 7 together with subheadings 2.17 and 3.1 illustrate the differences between the Navy and Marine Corps in the positioning of military officers and civilian employees.

There are some reasonable arguments that can be made which tend to support the present positioning for each service. The Civil Engineer Corps Officers are operating in their primary specialty field, whereas the Marine Officer is operating in his secondary specialty. This means the CEC Officer can be expected to bring more public works experience to the billet than a Marine Officer with the same length of service. The Marine Officer in a public works billet is expected to spend approximately twenty percent of his time in training for combat.

The CEC Officer can be expected to bring formal engineering training to the billet. He will be a graduate engineer and possibly have a post graduate degree in Engineering or Public Works Management. He will have attended Civil Engineer Corps Officer School, whereas the Marine Officer will have attended Marine Combat Engineer Officers course for six weeks. (The Marine Corps is presently looking into the possibility of post graduate education for some of its Public Works Officers (MC,FMO), but has not sent any yet). (53)

If a war breaks out the chances are that most Marine Officers in Public Works would be called away from Public Works to combat related duty. The Marine Corps positioning would allow this loss to occur with minimum impact on public works operations. While most CEC Officers served in Vietnam during the war, the public works billets were generally filled by other CEC Officers. The CEC strength rose from \pm 1600 officers before the war to a peak of 2188 in December 1968 which allowed approximately one third of its officers to be in Vietnam or Vietnam support functions without significant vacancies in

public works billets. (54)

Public Works generally is a highly technical profession requiring a lot of experience. The average new graduate of Marine Combat Engineer Officer School or Civil Engineer Corps Officer School (who is a recent graduate of an engineering college) is at a tremendous disadvantage in knowledge and experience to many of the civilians at a Public Works Department to which he might be assigned.

For example: a GS13 Civil Service employee with twenty years of government service, (not including three years in the Army during the Korean War) who began his civil service career as a carpenter apprentice after military discharge, has worked his way up to the Maintenance Division Directorship. The Public Works Officer at this same Department may be a Lcdr. with twelve years experience, the assistant Public Works Officer may be a Lt. with seven years of experience and the Shops Engineer may be a Ltjg. with two years experience. With no reflection on any particular officer in the positions, it is possible to visualize this as a potential problem area.

One advancement path in civil service and his profession that is available to the Division Director is to leave the activity and move to a staff in Washington. This may mean that the activity has lost its most valuable public works man. Good civilian employees are no different than good military officers in wanting responsible positions and reasonable promotion opportunities for diligent and productive performance.

Not only do good civilian employees and military want these opportunities, but the Department of Defense has set the following

goals (as a portion of their Human Goals Charter first promulgated in August 1969).

"Our Nation was founded on the principle that the individual has infinite dignity and worth. The Department of Defense, which exists to keep the Nation secure and at peace, must always be guided by this principle. In all that we do, we must show respect for the Serviceman, the Servicewoman and the Civilian Employee, recognizing their individual needs, aspirations and capabilities.

The defense of the Nation requires a well-trained force, Military and Civilian, Regular and Reserve. To provide such a force we must increase the attractiveness of a career in Defense so that the Service member and the Civilian employee will feel the highest pride in themselves and their work, in the uniform and the military profession.

The attainment of these goals requires that we strive--to attract to the Defense service people with ability, dedication, and capacity for growth;

To provide opportunity for everyone, Military and Civilian, to rise to as high a level of responsibility as possible, dependent only on individual talent and diligence; (55)

4.7 Chains of Command

The contrasts in the chains of command, resources, and advice are fairly self evident, as illustrated in Figures 2 and 6. The effect of these contrasts on facilities maintenance is not quite as clear, but it is felt that certain observations can be made.

It is obvious that the Navy with approximately 1000 activities "owning" Class I and II property,¹ (56) can not be organized as simply and directly as the Marine Corps, with forty-four activities

¹ There are approximately 600 type A inspection summaries received annually. The difference between 600 and 1000 activities can be accounted, for the most part, by Navy Reserve training centers and civilian operated activities which are grouped by Naval District.

"owning" Class I and II property. The plant account of thirteen Marine Barracks at Naval Bases is scheduled to be transferred to the Navy in the near future, which will reduce the Marine Corps Class I and II holders to thirty-one. (57) It is, however, equally obvious that the length and complexity of the present Navy chains of command and technical advice are expensive and cumbersome.

The size of the Marine Corps enables the following facility management assistance to occur. The Facilities Branch of the Marine Corps Headquarters schedules an annual maintenance management visit with each Marine Corps activity each year. One of four men in the Headquarters visits the activity to review maintenance management, observe and counsel problem areas, provide Headquarters maintenance philosophy, and exchange ideas from other Marine Corps activities. (58) Prior to the Unilinear Navy concept, the Naval Facilities Engineering Command's Field Divisions used to conduct annual Management Assistance Team visits at Navy activity, but these have all but been eliminated due to the Navy re-organization and fund limitations. It is now the Major Claimant's responsibility to provide this assistance which is normally done on a request basis. When so requested, the Major Claimant usually asks his NAVFAC REP to accompany him. The visits that do take place are usually to counsel on the specific problem raised.

One week Facilities Management Conferences are held bi-annually for all Marine Public Works Officers (MC,FMO) together with some of their staffs and Headquarters personnel. On alternate years conferences are held on each coast, also with Headquarters personnel participating. These conferences are held at different Marine Bases and provide inval-

uable exchanges of ideas, Headquarters philosophy, and management assistance. (59) It is known that some Navy sub-claims have had similar public works conferences, but would less frequently have Chief of Naval Operations or NAVFAC participation.

Concerning budgeting and allocation, discussed in sub-heading 4.3, the Navy's multiplicity of layers and advisors does not lend itself to facilities maintenance funding in uniform proportion to need, throughout all Navy activities. This is not necessarily a plea to return to the Single Executive for Facility Management,¹ but that is one alternative to reduce the multiplicity.

In sub-heading 2.13 it was pointed out that there were Civil Engineer Corps Officers on all staffs in Figure 2. In addition there are civil service employees on each staff within a "facilities division." When realistic evaluation's are made, as to the amount of resources applied to public works or facilities management the salaries expenses and billets of these staff officers and civilians together with the public works portion of NAVFAC and EFD's must be included. Then analyses must be made as to whether this existing distribution of officer and civilian billets, grade levels, and dollars is the optimum one for accomplishing public works.

4.8 Levels of Support Provided

The dollars expended for facilities maintenance per million dollars of plant value is one of the most significant influences on

¹ Under the Single Executive for Facilities Management, NAVFAC had line responsibility for all Navy Public Works. All dollars and billets for public works were budgeted and allocated by NAVFAC and its EFD's. This concept was in use for approximately four years, from 1962 to 1966.

maintenance condition. In many ways it also reflects attitudes or the "light" in which facilities are viewed. In fiscal year 1973 the Marine Corps spent \$42,474,000 on maintenance of \$3,120,000,000 worth of facilities. This represents 1.36% of the plant value. During fiscal year 1972¹ the Navy spent \$282,052,000 on maintenance of \$33,000,000,000 worth of facilities. This represents 0.86% of the plant value. Thus (based on this one year observation) the Marine Corps spent almost fifty percent more facilities maintenance money per million dollars of plant value than the Navy.

4.9 Inspection, Planning and Estimating

Although it is not an all-exclusive phenomenon, a significant historical pattern is in evidence in both the Navy and Marine Corps with regard to inspectors, and planners and estimators (P&E's), which should be kept in mind during this discussion. The predominant background for P&E's is that they were previously inspectors and prior to that, they were craftsmen. Some made the change from craftsman because advancement in the field was blocked. It can be assumed that craftsmen will continue to be the prime source for personnel entering the inspector position. Aside from this historic "advancement" path, both Navy and Marine Corps inspectors and P&E's traditionally work solely in one of three functional areas (electrical, mechanical, or structural) and only as an inspector or a P&E. Normally daily job assignments are given out by the inspection branch head. At the Marine Corps Education and Development Command, Quantico, Virginia

¹ Fiscal year 1973 figures were not available.

the triple innovation, described in heading 3.25 is being piloted. It is felt that there may be merit in this innovation and this pilot installation should continue to be observed.

First, assigning an inspector a group of buildings or geographical area for which he is solely responsible has merit and would be supported by job enrichment analysts.

Secondly, the idea of an inspector, planning and estimating the deficiencies he identifies also has merit from a job enrichment standpoint. Implementation of this aspect would also result in an energy savings, because only one man would have to visit the site. Having cross trained personnel also provides far more flexibility, especially if forced manpower reductions occur. The third aspect, which will be the most difficult, is having one man be responsible for identifying all deficiencies. As will be recalled, traditional organization had three fields of specialization among the inspectors; general work which includes painting, carpentry, and masonry; electrical work and mechanical work. The difficulty in implementing this aspect is compounded by the fact that this former craftsman is also trying to learn to be an inspector, a planner and an estimator all at the same time.

While there may be advantages in the above changes some disadvantages or problems can be foreseen. If the Inspector and P&Es are combined, then once a man or woman becomes an Inspector-P&E there is only one more logical step he or she can take career-wise, and that is to be Division Director. Under the existing system a man becoming an inspector, from being a craftsman foreman for instance,

would have several realistic advancement steps ahead of him, which is a healthy environment for someone to flourish in.

In summary, it is felt that some of the innovation in this area may bring significant returns in productivity and energy savings, but caution should be taken especially during the implementation stage. It may be possible to circumvent some of the disadvantages by establishing several grades of Inspector-P&E's, with the higher grades having larger geographic areas of responsibility.

It must also be kept in mind that the functions of inspection, and planning and estimating are looked upon by many as serving different ends. Inspection is viewed as identifying deficiencies and affixing a rough estimate for correction. The completion of this sequence is sufficient to place a request for resources to correct the deficiency, whether against the current year's resources or by increasing the backlog. This then can be seen as an important step in the budgeting process. Planning and estimating is then looked upon, as a "tool" to increase productivity or produce a better solution on work that is to be accomplished in the near future. These views should be kept in mind if the two functions are combined in one man.

Some of the above discussion is academic at small activities which have just a few personnel in the Maintenance Control Division, for they already combine these functions in various manners. These small activities together with the Marine Corps Education and Development Command at Quantico may provide an excellent laboratory to study these innovations before large scale implementation is attempted.

4.10 ADP Aided Inspections

Figure 9 illustrates an excellent time saver Camp Lejeune has innovated, for facilities inspection. The inspectors now have a form which contains all descriptive data about the individual facility such as name, building number, category code, the last time that specific work was done, and the cost of that work. In addition, a prediction is given as to when it will need painting, carpentry rehabilitation, etc. The inspector merely reviews this checklist in the field and notes changes that he wants to make. For example, it may be predicted on an inspection form (Figure 9) that a building will need exterior painting in fiscal year (FY) 1975, but during his FY 1974 inspection, the inspector feels the paint will last till FY 1976. He merely pencils in a note moving the painting prediction to FY 1976. The change will be made on the next update of the Long Range Maintenance Plan. As can be seen, this relatively simple computer application measurably increases the productivity of inspectors. It appears that two additions to the inspection form (Figure 9) may provide increased convenience. It would appear that the basic outside dimensions of the building might be listed, along with the floor area in square feet. This way, rough material quantities for a rough estimate for reroofing, or placing new floor tile, etc., can readily be calculated.

In addition, it would seem quite helpful if the computer printed the work request and job order numbers for all outstanding uncompleted work on the facility on the inspection form. Not only would this be

extremely convenient, but would provide more detailed information to compose the Type "A" Inspection Summary. The next logical ADP application is to have the Type "A" Annual Inspection Summary mechanized, and possibly a program that lists the equipment scheduled for DIES in the succeeding month.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The Navy's Controlled Maintenance System was instituted to bring order and improvement to facilities maintenance, which it did. The system was devised to function in a reasonably realistic resource environment, in which dollars, people, and energy would be available in reasonable proportion to the assigned responsibilities. As partially evidenced by Figure 1, the present facilities maintenance posture of the Navy is an "unrealistic" environment for this (or possibly any) system to function effectively. The present posture emphasizes the importance of attempting a variety of innovations.

This heading contains the conclusions and recommendations which have resulted from this inquiry, with a few specifics as to how they might be tested and implemented.

5.1 Conclusions

Cost management was defined in a recently conducted graduate course (Public Works 242) as "an attitude, a positive attitude that continuous improvement can be achieved in the utilization of all resources. It is cost reduction and control practiced on a continuous basis. It is the measurement of how well resources are being used and the communicating and reporting of this utilization back to the entire organization to effect improved planning, scheduling, and decision making."⁽⁶⁰⁾ It is an excellent definition of management itself. It is this attitude that this thesis argues for, in addition to specific analysis and recommendations made. The reason

for arguing for the attitude as well as the specifics is because no two activities are exactly alike; and, the more people with this attitude, the better resources will be utilized.

The people at Camp Lejeune have internalized cost management into their daily tasks and should feel justifiably proud. They do not feel they have found the final answer so they are still looking to improve. It is believed that many other individual Navy and Marine Corps activities have innovated on the standard procedures, but possibly not on such a wholesale or successful basis. These activities are to be applauded, and also their superiors, who support this risk taking. To be sure it is risky; for many attempts at procedural innovation will meet with unexpected and undesirable consequences, and have to be seriously modified or abandoned. This risk taking and testing is the only way that genuine progress can be made.

Change for change sake is not being advocated and can not be considered progress, but continuous searching for better ways is progress. Application of a large quantity of financial resources may temporarily help or eliminate Navy facilities maintenance deficiencies but this in itself will not be lasting progress. (Some additional resources will definitely be needed, at least on a one time basis, due to the size of the present backlog of deficiencies.) A few years ago a television commercial put it in different words: "At General Electric progress is our most important product."

5.11 Specific Conclusions

It is concluded that the Navy Public Works procedures are more cumbersome and expensive than those at Camp Lejeune Marine Corps Base. It is further concluded that the standard Navy Public Works procedures are less cost effective than those at Camp Lejeune Marine Corps Base.

Specifically, it is concluded that the Navy places more emphasis and spends more money on Control procedures, Engineered Performance Standards, etc., than is needed for an effective Public Works Program. It is concluded that the Navy should have a preventative maintenance program for buildings similar to the Camp Lejeune cyclical maintenance program. It is concluded that material ordering, job order programming and scheduling by the shops at Camp Lejeune is successful. The Navy should adopt facilities related automatic data processing similar to that in use at Camp Lejeune. The Navy should re-examine military and civilian relationships and responsibilities in public works. It is concluded the length, complexities and inter-relationships of the chains of command, resources, and technical advice concerning public works matters are detrimental to cost effective public works. Also, the Navy needs some form of long range maintenance planning in order to anticipate maintenance requirements, in addition to identifying already existing deficiencies. It is concluded that the "area responsibility" concept of facilities inspection in use at the Marine Corps Education and Development Command Quantico, Virginia may be a forward step in providing employees job enrichment and growth as well as offering the Navy a potential cost reduction.

5.2 Recommendations

It is recommended that appropriate personnel of the Naval Facilities Engineering Command, and its Field Divisions visit the Facilities Department at the Marine Corps Base Camp Lejeune, North Carolina to personally observe the public works procedures and their impact on the facilities and the people who work with them. It is believed that these visits will bring at least some of the enthusiasm that the author of this thesis and the people at Camp Lejeune feel for their procedures of accomplishing public works.

It is further recommended that those aspects of the Camp Lejeune system felt transferable, be transferred to at least one of the Construction Battalion Centers and one of the Public Works Centers for closer evaluation.¹ Prior to transferring these innovations for evaluation, it is recommended that a framework be established to facilitate comparisons of the cost effectiveness and the impact on employees. Many considerations or variables should be examined or accounted for in this "before and after" comparison, such as: the effects of base size, and public works department size; the nature and condition of facilities, and the resources available for their maintenance. In this connection it may be advisable to also conduct at least one pilot test at an activity not reporting to the Naval Facilities Engineering Command in order to receive outside opinions. The author is confident these

¹ In heading 2.0 The Naval Facilities Engineering Command's responsibility assignments were pointed out. Also it was pointed out that, while their primary responsibilities were as staff for facilities, utilities, etc., to the Navy as a whole, they also have line responsibility for approximately eleven field activities (three Construction Battalion Centers and eight Public Works Centers) who "own" Class I and II plant account.

evaluations will result in the recommendation of many of the Camp Lejeune innovations to all Major Commands and field activities of the Navy.

APPENDIX A

NAVY MODEL PUBLIC WORKS CRITERIA



DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND

WASHINGTON, D. C. 20390

NAVFACINST 11014.47

101A/JHH:mcr

DEC 7 1970

NAVFAC INSTRUCTION 11014.47

From: Commander, Naval Facilities Engineering Command

Subj: Model Public Works Department; Certificate of Award for

Encl: (1) Criteria for Model Public Works Departments
(2) Procedures for Nomination and Validation

1. Purpose. To disseminate information concerning the Certificates of Award for Model Public Works Department.

2. Background. This award originated in FY 1967 to recognize outstanding performance by a Public Works Department. A Model Public Works Department must meet or surpass the criteria shown in enclosure (1). Activities having this award have been recommended as a "show place" to other activities and agencies. NavFac has also used a number of the model activities for testing program modifications. Since the inception of this program 25 of the 53 activities nominated have been certified as model.

3. Procedure. Certification of a Model Public Works Department involves three events. First, nomination of the activity by an Engineering Field Division. Second, validation by a NavFac team that the activity has achieved Model Public Works Department status. Third, a Certificate of Award is presented to the activity through the chain of command. Procedures governing these events are described in enclosure (2).

4. Information. The EFD functions in the Model Public Works Program: the identification and nomination of activities considered to be a "model", and the assistance to activities desiring improvement to qualify as a "model", are described in Task M9_Y of the OP-Plan 1-71. No resources are provided, however, in that plan to support the task. The deletion of resources from this task does not terminate NavFac support of the Model Public Works Program, but is to remove the implication that EFDs are directed to initiate and maintain that program. The two basic and fundamental Maintenance Division tasks, Basic Maintenance Management and Technical Maintenance Assistance, are supported in the OP-Plan. The Model Public Works Program is one possible technique for the provision and organization of that activity support by the EFD; for the motivation of superior performance in Public Works administration; and to recognize such superior performance.

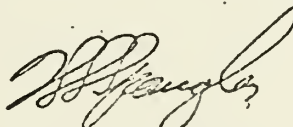
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EFD resource application through the Model Public Works Program is most appropriate in the following circumstances:

- a. Response to an activity request for assistance in qualification as a Model.
- b. EFD consideration that the Model technique is a most effective method for provision of Basic Maintenance Management and Technical Assistance.

5. Action. EFDs are welcome to nominate activities within their area for validation and certification as a "Model Public Works Activity". Upon nomination, NavFac will provide a validation team visit to the activity.



W. S. SPANGLER
Deputy Commander for
Facilities Management

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MODEL PUBLIC WORKS CRITERIASCOPE OF FUNCTIONS

- A. MAINTENANCE
- B. UTILITIES
- C. TRANSPORTATION
- D. ENGINEERING
- E. ADMINISTRATION AND MANAGEMENT
- F. FAMILY HOUSING

GENERAL

A model public works organization is responsive to local Command and customer requirements and operates within the policies and procedures established by the Naval Facilities Engineering Command.

The activities served shall have the appearance of a model public works effort, commensurate with funding levels, as evidenced by:

- a. Neat and orderly buildings and grounds
- b. Plants, shops, equipment, and administrative spaces in an acceptable condition
- c. Streets, sidewalks, other pavements, signs, traffic and other markings in an adequate state of repair

Material support to the public works organization shall be effective to permit orderly execution of work plans and schedules. Materials for public works shall be under the inventory control of the supply office.

The achievement of model status will be governed by a reasonable and practical appraisal of results as determined by the criteria and guidelines included herein.

MAINTENANCE

ELEMENT	TARGET	REMARKS
1. The activity has a scheduled Continuous Inspection Program and is on schedule. (Inspection Division files covering control, DEI/S and operator inspections and labor control report for previous month).	Control Schedule - 100% Control Performance - 80% Min. DEI/S & Operator Schedule 95% Min.	1.a. There must be a visual Control Inspection schedule covering 100% of all real property structures and systems. As a minimum, the schedule should indicate the structures (or parts of) and systems (or parts of) scheduled per month and months the inspection was completed. b. DEI/S and Operator Inspections should include an inventory covering at least 95% of appropriate dynamic equipment and real property components pertinent. c. Equipment identification, inspection check points, job orders, and data collection system should be identified.
2. Maintenance and repair work generated by inspection - % of total. (Sample of specific job orders from three month shop load plans and supporting inspection reports.	65% Min.	-----
3. EPS Utilization. (MCD Log of J.O.'s issued in past three months). (Divide total EPS estimated hours by total estimated hours and multiply by Productive Man-hour Control % and the factor 1.5625).	90% Or EPD assigned goal	3. If the EPD assigned goal is below 90%, justification and supporting data for the reduced goal must be made available to the validation team. The activity should indicate what corrective action is being taken, or planned, to obtain the 90% long range goal, if applicable.

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ELEMENT	TARGET	REMARKS
4. Is the data collected in Work Input Control used to adjust the level or trade composition of shop forces?	Yes	
5. Jobs currently scheduled on Master Schedule Board for this week that are also scheduled on appropriate Work Center Schedule Boards or Sheets (Master schedule, selected work center schedule boards or sheets).	85% Min. 75% Min. for Master Schedule	5. The Master Schedule should be projected for six weeks, or as a minimum, for the remaining period of the current Shop Load Plan. It should reflect the total scheduled and actual man-hours per work center per week, the total scheduled and actual man-hours per work center per job, and the scheduled and actual man-hours per job, per work center, per week. It should also include a waiting schedule, and a waiting material schedule or file. 75% of the Specific Jobs currently on the Master Schedule must be on schedule, i.e., cumulative actual man-hours are within $\pm 10\%$ of the total scheduled man-hours per scheduled job.

ELEMENT	TARGET	REMARKS
6. Minimum Specific Job Order loading for each Work Center - % of capacity. Capacity to be determined as the residual personnel after deducting Emergency/Service and Standing Job Order Requirements. (Shop load plans - current and next two months):		
First Month	90-100%	
Second Month	70-90%	
Third Month	60-80%	
7. Number of last months jobs on the Shop Load Plan which were started as programmed. (Last months shop load plan).	90% Programmed 80% Accomplished	7. Number of jobs on the past month's Shop Load Plan which were accomplished as programmed, i.e. within \pm 10% of plan.
8. All Work Center personnel are scheduled and/or accounted for on the Work Center Scheduled Boards or Sheets. (Selected work center schedule boards).	Yes	8. Sample selected jobs in field to determine whether the hours on the work Center Schedule Board agree with the number of craftsmen on the job.
9. Productive Effort (Latest Labor Control Report - Division Summary).	68-72%	9. -----
10. Labor performance in each branch. (Latest Labor Control Report).	95-105%	10. 80% of the Branches must exhibit a labor performance of 95-105%.
11. Productive Man-hour Control (Latest Labor Control Report - Division Summary).	80-85%	11. -----

MAINTENANCE

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ELEMENT

TARGET

REMARKS

12. Standing Job Order Effort. Labor Class Codes 04 and 05. (Latest Labor Control Report - Division Summary).
20-30%
13. Significant variations on completed Job Orders are investigated and corrective action initiated. (Tab B for previous month and NAVDOCKS 2371-Job Order Variance Investigation Report).
80% Min.
13. Compare a sample of Jobs with variances shown on Tab B, with Job Order Variance Investigation Reports.
14. Amount of Emergency/Service Work accomplished by E/S Work Center (Tab A and latest Labor Control Report).
50% Min.
15. Following reports are accurate and submitted on time: (Discuss with Administration Division).
Yes
 - a. Tab Report A - Feeder Report for Maintenance and Utilities Labor Control Report.
 - b. Tab Report B - Completed Job Orders.
 - c. Maintenance and Utilities Labor Control Report, NAVFAC 2728.
 - d. Public Works Management Indicators Report, NAVFAC 9-11014/70

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Enclosure (1)

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MAINTENANCE

ELEMENT	TARGET	REMARKS
16. Amount of Backlog of Essential Minor Maintenance supported by inspection reports and documented by estimates. (Sample of BEM jobs from WIC charts and supporting papers).	95% Min.	
17. Amount of known Backlog of Essential Minor Maintenance of Specific Job Order size reflected on the Job Requirement Status Chart. (Sample of Inspection Reports and WIC charts and review Type "A" AIS).	100%	17. A review of the last Type "A" AIS serves as a starting point to determine extent of coverage.
18. Variations of quantities reported on the Maintenance Cost Analysis Report from quantities shown in latest Inventory of Real Property, NAVFAC P-164, are accounted for. (Spot check selected items from the latest MOAR and P-164).	90%	18. 90% of the variations for items in sample must be identified with building changes, specific projects, etc. Multi-use buildings should be shown against the line item of primary use.
19. All Pest Control personnel have valid certificates, or only work under direct supervision of personnel with valid certificates. (Number of Pest Control personnel with valid certificates).	Yes	19. ----
20. All repair and maintenance projects have been prepared and submitted or are in process for prompt submission. (Inspection Reports, Special Projects Summary List, & discussion with MOD/Eng Division).	Two months submission	20. Unfunded deficiencies of special project scope must be submitted within two months after identification to be considered prompt.

Enclosure (1)

NAVFACINST 11014.47 CH-1

MODEL PUBLIC WORKS DEPARTMENTS

Procedures for Nomination and Validation

NOMINATION1. Eligibility

- a. Activities with Public Works Departments with at least 100 employees are eligible for nomination.
- b. Public Works Centers are not eligible for this award.
- c. Activities which have been certified as achieving Model Public Works Department status shall not be nominated (for another award) until the third year after the first award. (Example: Activity receiving award in FY 1968 could be nominated again in FY 1971).
- d. Activities nominated in prior years but not certified may be renominated provided they now meet the criteria.

2. Criteria. Criteria to be met by the nominated activity is provided in enclosure (1).3. By Whom. Engineering Field Divisions shall nominate eligible activities in their area when they consider the activities have met and are continuing to meet the criteria.* 4. When. Nominations may be forwarded to NAVFAC (Code 101) any-time during the fiscal year.5. Information Required. The nomination shall include the following data:

- a. A statement that the activity is now, and has been for the past 6 months, performing at or above standards set forth in the criteria.
- b. Name of the Commanding Officer.
- c. Name of the Public Works Officer.
- d. Normal working hours of the Public Works Department.

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- e. Desired or suggested date for validation visit. (Date should not conflict with IG or other inspections)
- f. Name and telephone number of contact point in EFD who will arrange for validation team visit.

6. Notification of Selection. After review of the nominations by Headquarters, NAVFAC, a schedule of validation visits will be prepared, indicating date of validation visit, and validation team members from Headquarters. This schedule will be issued to each EFD on or before 15 December. The schedule for FY 1971 will be issued about 20 March 1971. The EFD shall then notify the activity of the scheduled validation date.

VALIDATION

1. Team Composition. The validation team will include a leader and a member for each of the six functional areas of the criteria. Headquarters NAVFAC will furnish the team leader and the team members for maintenance, utilities, transportation, and family housing. Generally, the EFD will be requested to furnish the team members for engineering and administration. EFD counterparts for other functional areas are welcome and desired to promote communication and understanding between Headquarters and the EFDs. It is recognized that team composition may vary in named personnel due to events occurring between the time of the initial team selection and the validation visit.
2. Change in Schedule.
 - a. If the activity or the EFD desire to drop the activity out of the schedule, or desire a change in established dates for the visit, Headquarters (FAC-101) should be notified.
 - b. If Headquarters NAVFAC finds a need to modify the date of visit, the EFD will be requested to clear the proposed date with the activity.
3. Visit
 - a. Purpose. The purpose of the validation visit is to verify that the activity meets or surpasses the established criteria for a Model Public Works Department.
 - b. Arrangements for. The Headquarters NAVFAC team members will arrange for their own transportation to the activity. EFD participating personnel will arrange for their own transportation to the activity. The EFD (contact point) will generally be requested to arrange housing for all team members and to arrange initial and departure calls and conferences with the activity Commanding Officer and Public Works Officer.

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Enclosure (2)

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- c. Procedures During. Validation team visits usually require one and one-half to one and three-quarters days. The validation team will usually arrive at the Public Works Department about 30 minutes after the departments normal start of the work day.

- (1) The team leader, with the PWO, will make an initial call on the Commanding Officer. The time of this call will be at the convenience of the CO.
- (2) The team will convene with the PWO and his staff for the following:
 - (a) An introduction of team members.
 - (b) An introduction of activity personnel.
 - (c) A presentation by the team leader of the objectives of the Model Public Works Program.
 - (d) A short indoctrination by the PWO on the mission and size of the activity and the organization of the PWD.
- (3) The team then meets for general discussion and setting of a time table for operations.
- (4) Team members will then disperse, meet with PWD counterparts, and begin validation.
- (5) At close of business the first day, team members will meet and discuss findings and impressions, and establish schedule for the second day.
- (6) Depending upon the circumstances the team will convene about noon of the second day for final determination.
- (7) A departure conference with the PWO and his staff will be held shortly after the final determination. The group will be told that the activity is a model or is not a model, as the case may be. If the activity is not a model, the deficiencies will be explained. In any case, outstanding features will be recognized.
- (8) The Team Leader and PWO will make a departure call on the CO. The CO will be advised that the activity is a model or is not a model with an explanation.

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- (9) The Team Leader, or a selected member, will advise NavFac Headquarters (FAC-101) of the result by telephone if possible.

CERTIFICATES OF AWARD. NavFac Headquarters (FAC 101) will prepare two Certificates of Award for each model activity. Letters to the activity Commanding Officer, the EPD Commander or Commanding Officer, and the major claimant for the activity will be prepared for signature by Commander, NavFac. The Certificate of Award will be forwarded to the major claimant for presentation to the activity Commanding Officer and his Public Works Department.

The Certificate of Award is dated for the fiscal year in which validation occurred. The nomination and validation procedures are arranged so that an activity will not be issued a Certificate of Award oftener than every five years. The activity is expected to conduct its public works operations in accordance with existing policies and procedures thus maintaining its model status.

APPENDIX B

CRAFT CHECK LISTS FOR CYCLICAL
MAINTENANCE JOB ORDERS

CHECK LIST FOR CARPENTER RECURRING MAINTENANCE

BLDG. NO. _____

DATE _____

- () 1. Obtain user's comments before starting preventive maintenance work.
- () 2. Doors:
- a. Replace, tighten or adjust hardware.
 - b. Refit as required.
 - c. Replace panel (if broken through).
 - d. Replace or renail trim.
 - e. Replace or adjust transom operators (if applicable).
 - f. Replace doors if beyond repair.
- () 3. Windows:
- a. Replace, tighten or adjust hardware.
 - b. Check and correct (if necessary) window operation.
 - c. Secure screens; replace in messhalls as required.
 - d. Replace broken or missing window locks, balancers.
 - e. Replace or renail trim.
 - f. Minor repairs to venetian blinds (where required).
- () 4. Floors:
- a. Replace or renail baseboard or molding.
 - b. Secure steamline brackets to baseboard (if applicable).
 - c. Minor repairs to tile.
 - d. Secure or replace rubber treads and matting (if applicable).
- () 5. Walls:
- a. Replace or renail trim.
 - b. Replace or secure access cover to shower plumbing (if applicable).
 - c. Replace broken or missing mirrors.
 - d. Replace or secure toilet tissue holders, soap trays, towel bars, coat and hat hangers.
 - e. Secure handrails in stairwells (if applicable).
 - f. Replace or secure fan plaques.
- () 6. Ceiling:
- a. Replace or secure ceiling tile and other types (where applicable).
- () 7. Other:
- Make other minor repairs.

FOLLOW-UP WORK

CARPENTER WORK: List other discrepancies that cannot be defined as minor work; listing the item, size and location.

PLASTER WORK: List size and location of holes, completely through plaster and lath, also type of plaster.

MASONRY WORK: List type, size and location of masonry discrepancies.

SIGNATURE _____

USER'S SIGNATURE _____ DATE _____

MECHANICAL PREVENTIVE MAINTENANCE CHECK LIST FOR BUILDING PLUMBING

SCOPE: Limits: Include piping and accessories within the building (service entrance in). Individual operations requiring excessive time will be left unattended and reported under comments.

BUILDING NO. _____

DATE PM'd _____

() 1. User's comments:

Obtain user's comments before starting preventive maintenance work.

() 2. Water piping:

Leakage, loose connections, water slow, water hammer, material defects, water temperature, repair or replace.

() 3. Faucets, hose bibbs, gate valves, flush valves and flush boxes.

Noisy operations, replace worn washers, trim and realign seats where necessary, tighten leaking bonnet assemblies or renew packing, adjust or replace defective ball cocks and flush valves.

() 4. Shower heads, water sprays, and missing valves.

Replace or repair.

() 5. Plumbing supports and hangers.

Broken, missing or loose connections, defective material. Repair or replace.

() 6. Sanitary and drain piping.

Solids in strainers, slow drainage, odors from loss of water seal in traps, grease, back pressure. Relieve stoppage or slow drainage.

() 7. P-traps and trap standards.

Clogging, corrosion, grease, leaks. Repair or replace.

() 8. Plumbing fixtures.

Leaks, material defects, damage, corrosion of metal parts. Repair or replace defective parts or fixtures.

COMMENTS:

Journeyman's Signature _____

Date _____

User's Signature _____

The work noted above has been completed except as noted.

MECHANICAL PREVENTIVE MAINTENANCE CHECK LIST FOR BUILDING STEAM SYSTEM

SCOPE: Limits: Include piping and accessories within the building (service entrance in). Individual operations requiring excessive time will be left unattended and reported under comments.

BUILDING NO. _____

DATE PM'd _____

Steam Pit

() 1. User's comments:

Obtain user's comments before starting preventive maintenance work.

() 2. Piping (General):

Leakage, loose connections, flow, hammer, material defects. Repair or replace nipples and fittings as required.

() 3. Valves, traps and pumps:

Leakage, faulty or noisy operations, packing renewal if required, bearings, floats, collection of foreign material at sumps, supports. Repair or replace.

() 4. Gaskets and gages:

Defective material, leaks, settings; repair or replace.

() 5. Supports, insulations and expansion joints:

Defective material, correct operations, faulty insulation, loose connection. Adjust, repair or replace.

() 6. Police:

Foreign objects removed, interior of pit clean and unobstructed.

() 7. Pressure reducing and relief valves:

Adjust or report for replacement.

() 8. Heating coils:

Report defective coils.

COMMENTS:

Signature: _____

DATE: _____

User's Signature: _____

The work noted above has been completed except as noted.

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